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Electric Energy T&D MAGAZINE

MAY-JUNE 2008 Issue 3 • Volume 12

In this Issue

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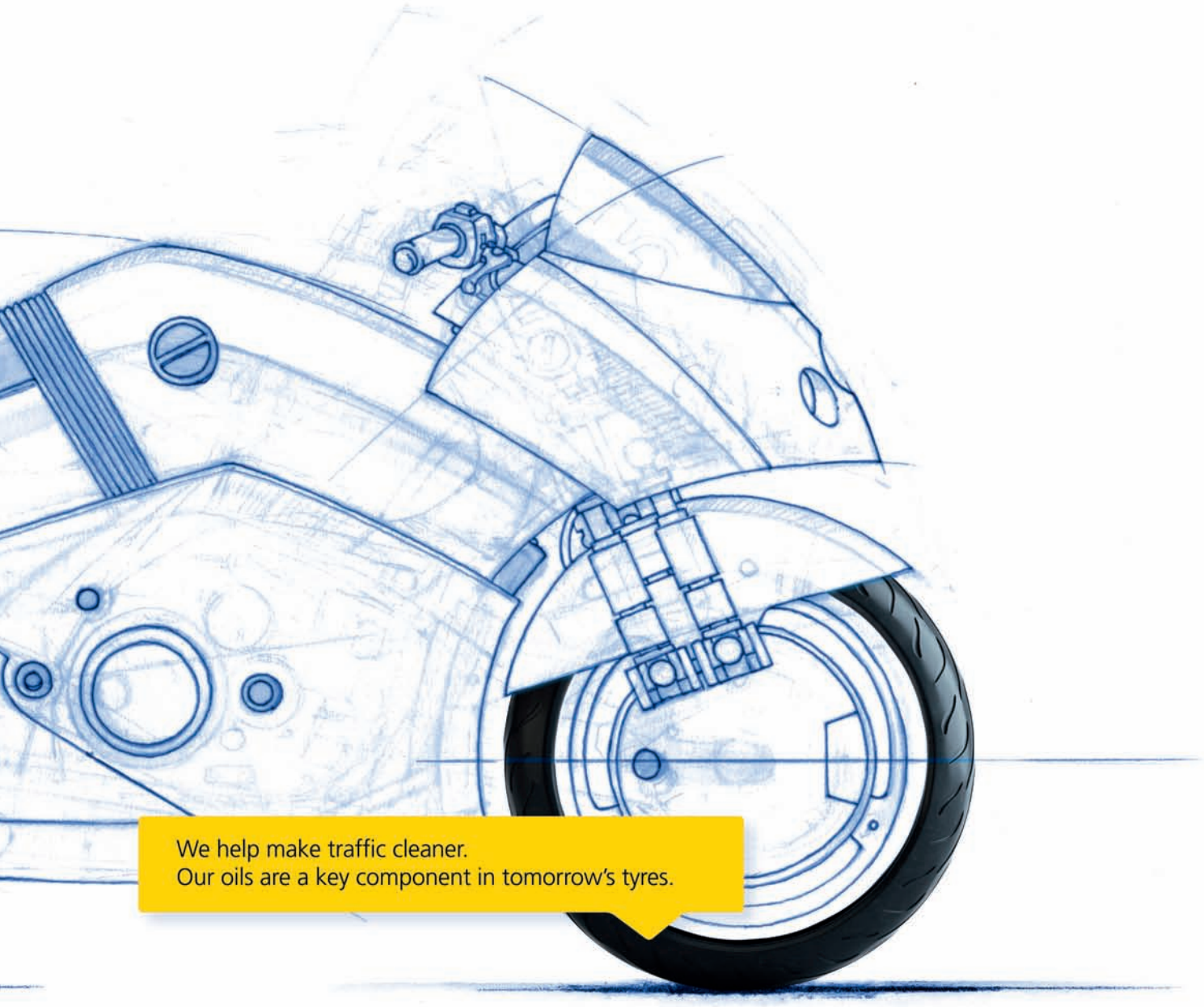

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BPA WORLDWIDE BUSINESS

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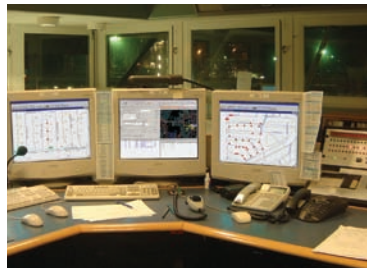

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ABB to Upgrade Transmission Control for Vital North American Power Interconnector

New control system will enhance grid reliability and extend link's life span

Zurich, Switzerland, April 14, 2008 – ABB, the leading power and automation technology group, has been selected by Hydro-Québec, Canada, for an upgrade of a high-voltage, direct current (HVDC) converter station. The 25-year-old 1000-MW (Megawatts) Châteauguay back-to-back HVDC station will be equipped with ABB's control and protection system, MACH 2.

"ABB's well-proven HVDC control technology, MACH 2, will improve the performance and extend the life of the converter station," said Peter Leupp, head of ABB's Power Systems division. "Upgrading of HVDC plants is a good illustration of ABB's long term commitment to the protection of investments in the transmission industry."

The MACH 2 system is the world's most commonly used control system for HVDC and FACTS (flexible AC transmission systems) with over 400 systems in operation. It is used in all types of HVDC installations from small, but very demanding, HVDC Light installations, to large, 3,000-MW power links.

ABB has the widest experience of control system upgrades in the HVDC industry. Recent upgrade projects delivered by ABB include the Square Butte and the CU HVDC links in the U.S., the two Skagerrak HVDC links in Scandinavia and the on-going refurbishment of the Apollo converter station of the Cahora Bassa HVDC link in Southern Africa.

Hydro-Québec generates, transmits and distributes electricity, mainly using renewable energy sources. The company provides electricity to customers in Québec, other parts of Canada, as well as to northeastern parts of the U.S. and is one of the world's largest producers of hydroelectricity.

The new control and protection system in Châteauguay will be commissioned during April and May in 2009, with an outage time of only seven weeks. Since the station comprises two blocks and each block will be renovated separately, the station will maintain at least half of its capacity during the installation period.

For more information, please contact:
ABB Power Systems Division
Communications
Sian Curtis
sian.curtis@ch.abb.com
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RITZ SELECTS RAUCKMAN TO MARKET HOTLINE TOOLS in USA

Swansea, IL USA – March 20, 2008 – One of the world's largest manufacturers of lineman's tools and equipment has teamed-up with a long time marketer to North American electric utilities. Ritz (formally known as Ritz DoBrasil) has teamed up with Jim Rauckman to form American Hotline, LLC. www.americanhotline.com.

Located in Belo Horizonte Brazil, Ritz produces hundreds of products related to the live-line maintenance of electric utility lines. The Ritz offering includes transmission tools up to 800 kV, substation maintenance tools, distribution hotline tools and even tools for maintaining energized secondary voltages. Ritz has been supplying hotline tools in South America, Europe, Asia and the Middle East for nearly 40 years. Additionally, Ritz has supplied component parts for many years to several US manufacturers of hotline tools.

American Hotline, LLC is managed by Jim Rauckman – who also runs Rauckman Utility Products, LLC, and with Kevin Clizer operates Rauckman High Voltage Sales, LLC both based in the St. Louis suburb of Swansea, IL. American Hotline will offer the Ritz products through a network of independent manufacturers' representatives.

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According to Jim Rauckman; "I was thoroughly impressed the first time I visited the Ritz facility more than 10 years ago, and amazed at how much they have grown since then. The Ritz package offers tools and techniques that are essential to satisfying today's demands on the utility system."

Emil Ritz Jr. added; "Over the years, we have been able to grow our business in different parts of the world. We were waiting for the right partner to establish our presence in the #1 world economy. We feel honored and highly motivated to make this venture a very successful one!"

Both Ritz and Rauckman have similar backgrounds: The Ritz family and A.B. Chance (then run by the Chance family) formed a joint venture entity in 1973 known as Ritz-Chance in Brazil. In 1989, after some 16 years, the Ritz family purchased 100% of the ownership shares and changed the name to Ritz DoBrasil. Jim Rauckman was an employee of A. B. Chance Company from 1983 until 1999, also a 16 year relationship. Before leaving Chance in 1999 Rauckman held positions in; engineering, sales, product management, international sales and general management.

Effective May 1, 2008 American Hotline's USA facilities will be located at MidAmerica Airport in St. Clair County Illinois - approximately 20 miles east of downtown St. Louis. For more information visit *www.rauckman.com*.

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IntelliTEAM II® Universal Interface Module

Other intelligent electronic devices (IED) not of S&C manufacture can now be incorporated into the IntelliTEAM II Automatic Restoration System with the use of S&C's Universal Interface Module. The module enables the host device to communicate with other team members and implement IntelliTEAM II restoration decisions. Fault interrupting and protective functions remain under control of the host IED.

The Universal Interface Module adds IntelliTEAM II functionality to the fault-interrupting decisions made by the relay. The UIM exchanges information with the other team members as needed and polls the relay for status and analog data, which are used for the IntelliTEAM II process. If a fault interruption or loss of source occurs, the UIM provides the interface to, and operates, the substation relay/breaker to restore as many feeder segments as possible.

With the introduction of the Universal Interface Module a wide variety of controls can now be applied in an IntelliTEAM II system. These include:

- SEL 351S Relay
- SEL 351R Relay
- Nu-Lec CAPM-5 Recloser Control
- Cooper Form 6 Recloser Control
- ABB REF550 Control
- GE F60 Relay

Other devices are being certified currently and this list will continue to grow.

The UIM can be rack-mounted (19" wide and 3 spaces high), or can be panel-mounted inside most relay enclosures. The UIM has four serial ports and one ethernet port to handle team communication, SCADA communication, polling of the host device, and local monitoring and configuration. The local data port allows you to connect your computer to the UIM and change setpoints or upload logged data using the user-friendly IntelliLINK® Setup Software. The control software in the UIM can also be updated, offering a simple migration path to new features. The UIM utilizes DNP protocol for peer-to-peer communications with IntelliTEAM II system team members and for SCADA communication.

To learn more about the Universal Interface Module and IntelliTEAM II, visit the S&C website at *www.sandc.com/uim*

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You can visit our web site, *www.dranetz-bmi.com*, for more information and for our data specs.

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MILSOFT UTILITY SOLUTIONS DEPLOYS ARC-FLASH CALCULATIONS IN WINDMIL® ENGINEERING ANALYSIS

ABILENE, TX, March 18, 2008 – Milsoft Utility Solutions, an industry leader in engineering analysis, outage management, interactive voice response and mapping systems, has deployed, in beta, Arc-Flash calculation functionality within WindMil Engineering Analysis. Deployed at several client sites, the beta period is expected to run 90 days, with the software scheduled to be released as Gold at the Annual Milsoft Users Conference in Orlando, Florida, June 25-27, 2008. During this interim period, Milsoft will work with beta users to define and implement improvements and enhancements to the Arc-Flash functionality released in beta.

Based on IEEE Std. 1584 - 2002, Guide for Performing Arc-Flash Hazard Calculations, the addition of Arc-Flash provides calculation methods in WindMil to determine the incident energy level a worker could be exposed to at a specified distance from the arc. The new enhancement also provides the distance to hazard levels at specified points in the modeled system.¬

"Flash protection is required when examining, adjusting or servicing energized equipment, and the equipment should be field marked to warn of potential electric arc-flash hazards," said Jeff Kirkes, Vice President of Support for Milsoft. "It should be noted that there isn't a 100% accurate method for calculating the degree of exposure that workers may face. However, the equations given in IEEE Std. 1584 are the recognized industry standards for assessing arc-flash and we are proud to offer this enhancement to our users."

The number of arc flash incidents in the United States is greater than many engineers realize since most accidents don't make the daily news. Chicago-based Capelli-Schellpfeffer, Inc. reports that five to 10 arc-flash injuries resulting in hospitalization occur every day. IEEE 1584-2002 was developed to help protect people from arc-flash hazard dangers. The predicted arc current and incident energy are used to select appropriate overcurrent protective devices

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and personal protective equipment, as well as to define a safe working distance.

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Positron Adds a Compact HVI Solution to Its Fiber Optic Isolation Portfolio

Positron provides reliable isolation solutions to protect telecommunications circuits entering substations, power generating plants and cell site communications facilities. Positron is expanding its TeleLite Fiber Optic isolation portfolio by offering the new "compact High Voltage Interface" (cHVI) solutions. The new TeleLite cHVI product portfolio can now be cost-effectively and rapidly deployed in small applications.

The cHVI product portfolio is designed to reduce the Cost of Ownership (COO) and improve operational flexibility. The new products are designed to facilitate ease of installation and field maintenance, and provide the needed flexibility to use the full portfolio of TeleLite plug-in cards. This assures exchangeability across all the TeleLite HVI and cHVI configurations.

TeleLite cHVI is available in 2-card or 3-card enclosures with pedestal and solar powering options designed to function in both inside and outside installations as well as in a 1U 2-slot shelf (see Figure 1). These packages are preconfigured to meet all applicable IEEE Recommendations and FCC standards for High Voltage isolation installations.

cHVI Solutions for the Copper Fiber Junction

Choose from a 2-card and 3-card cHVI solution for the Copper Fiber Junction (CFJ). TeleLite's cHVI offerings are based on NEMA-4 compliant enclosures for outdoor deployments, rated from -40 to +167ºF (-40 to +70ºC). They are designed to meet IEEE 1590 recommendations and include terminal blocks, facility protection options and additional space for auxiliary equipment.

Options:

- Flexible mounting options include H-frame, pole-mounted or outside plant pedestal
- Solar panel powering for CFJ sites, which do not have access to local hydro powering

cHVI Solutions for the Optical Equipment Interface (OEI)

The 1U cHVI solution is ideal for smaller isolation applications providing for a cost-effective 2-slot shelf installation solution that mounts in a standard 19" or 23" telecommunication rack.

Multiple 1U cHVI shelves can be stacked and powered from -48V in a daisy chained configuration for up to three cHVI 1U shelves when expansion is required.

Special considerations at the 300V point for the CFJ location

IEEE 1590 recommendations, developed by protection engineers from the telecommunications and electrical utility industries, strongly recommend that the CFJ be installed at the 300V point i.e. outside the Zone of Influence (ZOI).

The ZOI and the 300V point will vary from site to site, depending on soil and grounding techniques deployed. This may extend the 300V point to several kilometers beyond the High Voltage location.

Positron firmly supports the IEEE recommendations as locating the CFJ beyond the 300V point will ensure the safety of personnel and avoid serious injury.

For additional information on the cHVI TeleLite solutions:
www.positronpower.com/chvi

Circle 45 on Reader Service Card

Utility Equipment Leasing Corp. Acquires Fleet

Utility Equipment Leasing Corporation (UELC), a family owned and operated company specializing in the rental and leasing of utility equipment for over fourty years has announced a recent agreement with Baker Rental and Leasing to acquire their entire equipment fleet.

Commenting on the growth, President Judie Taylor states, "We are so glad to have the opportunity to strengthen our presence nationwide. UELC's goal is to continue to grow and provide our customers with the quality equipment they need."

UELC's strong infrastructure, combined with the equipment expansion, gives UELC a chance to maximize their portfolio of rental and leasing options.

Starting with one truck and one customer, UELC has continued to grow. With equipment ranging from aerial lifts, digger derricks, material handlers, cable pullers, and track vehicles, UELC's rental and leasing options are proven to always be a good business decision for contractors, municipalities, utilities, and other industries across the nation.

With a headquarters in the Metro Milwaukee area, UELC has a nationwide network of service ready to fulfill any utility equipment needs you may have. Let your job be our job . . . it's NO PROBLEM! To learn more about Utility Equipment Leasing Corporation visit *www.uelc.com*.

Circle 46 on Reader Service Card

By Michael A. Marullo, Automation/IT Editor

It's HIE Time…

Time, that is, for the Holistically Integrated Enterprise. It's been a longtime coming, but I think it has finally arrived. For decades utilities have viewed the various components, systems, platforms and networks as stand-alone, isolated islands of technology and applications that shared little in common. And, although that was perhaps an appropriate view 20+ years ago when the various automation platforms bore little or no resemblance to one another, it is certainly out of step with the standardized, interoperable and extensively interconnected automation/IT solutions at our disposal today. No, you can't do it all at once, but you do need to envision it all – holistically across the enterprise. Anything less is going to cost you, big time.

But it isn't just the technology that has changed. A drastically changed regulatory environment coupled with sea change responses to reliability, security, compliance, sustainability and various other challenges have necessitated a comprehensively choreographed and closely coordinated change in how we can – and indeed must – address and overcome the challenges utilities face in the 21st century.

A lot of the people I talk to these days – users and suppliers alike – are quick to tell me that Smart Grid is the thing that is going to fix the morass of tangled products, platforms and technologies that has been incrementally assembled over the past half century. Everyone seems to be jumping on the SGI (Smart Grid Initiatives) bandwagon like desert dwellers flocking to an oasis. Problem is, I think that a lot of them have the cart before the camel. Here's what I mean…

Back in the day (i.e., before we all got 'Wintelled'), automation platforms not only didn't talk to each other – they hated each other. Okay, not really hated, but there were certainly no such things as widely accepted protocol standards, substation LANs (local area networks) or COTS (commercial off-the-shelf) hardware and software. Everything was pretty much a custom effort as evidenced by routine budget overruns and badly blown delivery dates. (Remember, I'm only talking historically here…) Because of those limitations, projects were treated – arguably appropriately – on a case-by-case basis. Every project was a new design, and every old project was a pain in the butt to support, but it was all painfully consistent with the times. (Believe me, those of us who were around for all the fun still remember!)

And then along came standardization: Common information models, off-the-shelf hardware and shrink-wrapped software. Everything talks to everything; wired or wirelessly. Problems solved! Well, um, not quite. It seems that although the suppliers eventually delivered those standardized, compatible and interoperable solutions – just as users had always wanted – the project planning, budgeting, designs and implementation process remained stuck in the traditions of the 1970s. (I really wanted to say, Stuck on Stupid, the phrase that Lt. General Russel L. Honoré memorialized here in New Orleans during the Hurricane Katrina aftermath, but I certainly wouldn't want to offend anyone who might not appreciate the humor in that analogy.)

Suffice to say that the automation project methodology employed at most (no, not all… I said most) utilities remains the same old sequential model. That is, each year the utility targets and budgets a specific dimension of their automation infrastructure (GIS, SCADA, OMS, etc.) with the knowledge and intention that the rest of the task will be addressed in future years; a process I've referred to in earlier editorials as "compartmentalized budgeting."

To me, this is sort of like deciding to cook a meal but not settling on what the meal is

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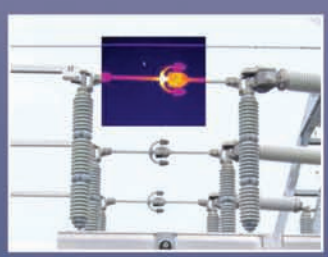

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going to be before you head out to the grocery store. Once you get there you do your best to buy good stuff at reasonable prices, but then when you get back home you discover that liver and chocolate syrup don't really go together very well – even though both ingredients were good brands on sale at very good prices.

So here we are – some 20-30 years later – with the world's most eclectic potluck dinner when it comes to automation/IT platforms. Smaller utilities may have it in smaller portions because their appetites and resources are modest. Oh, and big utilities? Well, they have a veritable smorgasbord of potluck for any occasion. Okay, enough with the food analogies… what I'm really trying to say is this:

1. Attention Utilities: You got your wish; the systems all talk now, and better yet, they actually understand each other! Let's face it, you can't stop Baby-boomers from retiring, and you surely cannot replace your entire (now rapidly deteriorating) infrastructure overnight, so do what you CAN do by using the myriad automation tools readily available to mitigate the problems you can't fix any other way. It might not be free, but it is available.
2. SGI is NOT going to be a panacea for anything, much less everything. In fact, it's going to be a huge and very expensive undertaking that a lot of you reading this probably won't even be around to see completed.
3. And by the way, where is all of this investment going to come from? Historically, it's been pretty doggone hard to get even relatively modest automation/IT projects justified, even those with a reasonably attractive ROI. But more comprehensive projects can have better economies of scale and also tend to get better support from the top when properly conceived.
4. Yes, you're starting anew, but let's learn from what has come before. Specifically, we need to start taking the longer – holistic – view of critical automation and infrastructure investments.
5. And finally – like it or not – a new 30-50 year life cycle starts every time you procure an asset and/or a system to monitor and control that asset, so let's include the automation on the front end now instead of making your successors scramble to find out how much life is left the next time around. (Yeah, I realize that there's a certain poetic just to that, but let's not go there.) ■

Behind the Byline

Mike Marullo has been active in the automation, controls and instrumentation field for more than 35 years and is a widely published author of numerous technical articles, industry directories and market research reports. An independent consultant since 1984, he is co-founder and Director of Research & Consulting for InfoNetrix LLC, a New Orleans-based market inteligence firm focused on Utility Automation and IT markets. Inquiries or comments about this column may be directed to Mike at MAM@InfoNetrix.com.

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"Identity Management: Powering Compliance and Security in the Energy Industry"

By David Ting, CTO and founder, Imprivata

Energy companies today have more to deal with than ever before—from a complex and challenging regulatory environment, to ecological challenges and pressure from investors and shareholders to increase profits. To survive, many energy companies have had to re-think the way they operate and make organizational changes to become more efficient. However, at the same time, concerns have increased throughout the industry about the security of energy companies' infrastructure and assets. In response to these concerns and the increased government oversight from the Federal Energy Regulatory Commission (FERC) that soon followed, the energy industry, through the North American Electric Reliability Corporation (NERC), developed new security standards regarding the protection of critical infrastructure.

While the higher-level goals of these Critical Infrastructure Protection (CIP) standards have been clearly defined, NERC has left it up to each energy company to determine how best to achieve them operationally. Although there has been a good deal of discussion and debate within the industry, best practices for CIP compliance have yet to be identified—and no clear consensus has emerged on how to proceed. The only thing agreed upon at this point is that the earliest some organizations are required to be "substantially compliant" is by mid-2008 and "fully compliant" by mid-2010—meaning that most energy companies cannot wait until there is a consensus to act, as they could be facing the prospect of failed audits and substantial fines for non-compliance.

In order to comply with these standards quickly and easily and avoid any penalties, energy companies are turning to security technology solutions, such as identity management, that can assist in proving compliance, increasing overall security and providing a platform for future security enhancements.

The Challenge of Self-Defining and Self-Securing Assets

For many energy companies, the mandate to secure all critical assets—and in particular, critical cyber assets—is a daunting one. Not only do energy companies have to organize and define critical assets for themselves—a complex task on its own—but they have to secure the assets from both a physical and a logical (IT) perspective and provide documentation of both.

Adding to the challenge is that traditionally there has been little overlap between energy companies' IT departments and the engineering organizations responsible for the Supervisory Control and Data Acquisition (SCADA) and Energy Management Systems (EMS) that control their operations. Most energy companies have not dealt with the IT security requirements that other regulated industries have faced and subsequently often do not have the in-house IT security expertise or dedicated resources needed to develop and implement a CIP compliance plan for cyber security.

Despite the challenges, energy companies have more than one incentive to achieve CIP compliance. While the threat of disasters such as terrorism or a blackout has been the most urgent force driving the development of the CIP standards, the benefits of compliance go far beyond minimizing the risk and impact of cataclysmic problems.

The good news is while some of the CIP standards require a significant commitment of time and human resources, there are technology solutions available that can quickly, easily and affordably help organizations meet many of the CIP requirements—and more importantly—ensure the security of all critical assets.

Organizations that attain CIP compliance are empowered to better protect against both physical and logical attacks from both internal and external sources, preventing remote access to the system and stopping insiders looking to sabotage the system from within. In addition, by fulfilling the CIP requirements, energy companies can also gain greater control and visibility over their operations and use of resources, increase safeguards for confidential business and customer data, improve service levels and compete more effectively.

The NERC Mandate

As the electric reliability organization for North America, NERC's mandate is to improve reliability and security throughout the bulk power system in the United States and Canada. The first 83 NERC reliability standards were approved by FERC in early 2007, making them the first mandatory and legally enforceable standards for the U.S. bulk power system. These standards encompass all aspects of power generation and distribution operations.

Beyond trying to understand what the CIP standards require, it is equally essential for energy companies to understand what problems the standards are intended to solve. In a report entitled "Top 10 Vulnerabilities of Control Systems and

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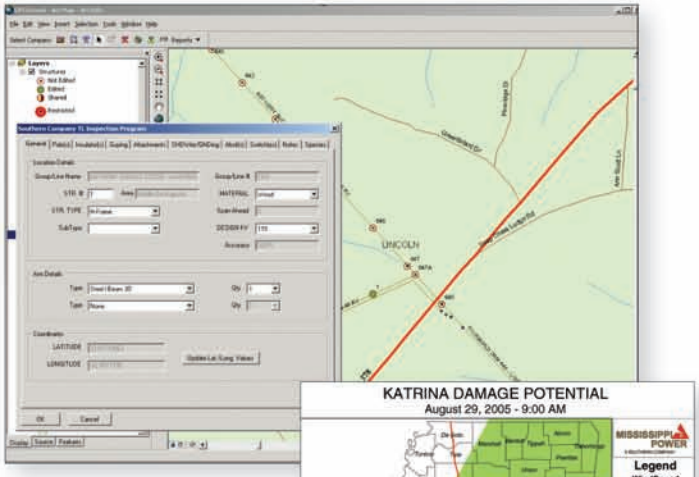
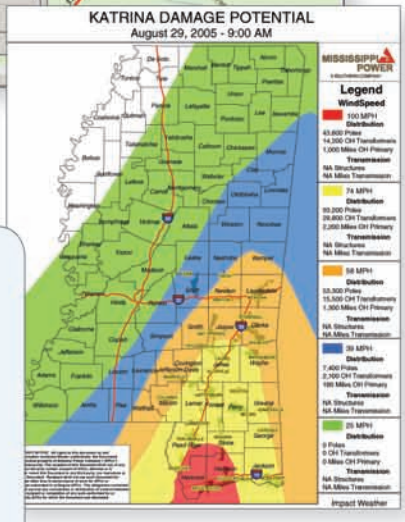
Southern Company's TransView Appplication provides systemwide query and work design for all five operating companies.



GIS shows specific poles, wires, and materials inspection data.



Mississippi Power easily manages important data such as Hurricane Katrina's damage potential in their service territory.

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Louis H. Occhi,
Mississippi Power

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Their Associated Mitigations," published in March of 2007 (http://www.nerc.com/~filez/cipfiles.html), NERC and the U.S. Department of Energy identified the following as critical vulnerabilities in the energy industry:

- Inadequate policies, procedures and culture that govern control system security;
- Inadequately designed control system networks lacking sufficient defense-in-depth mechanisms;
- Remote access to the control system without appropriate access control;
- System administration mechanisms and software used in control systems are not adequately scrutinized or maintained;
- Use of inadequately secured Wi-Fi wireless communication for control;
- Use of a non-dedicated communications channel for command and control and/or inappropriate use of control system network bandwidth for non-control purposes;

- Insufficient application of tools to detect and report anomalous or inappropriate activity;
- Unauthorized or inappropriate applications or devices on control system networks;
- Control systems command and control data not authenticated; and
- Inadequately managed, designed, or implemented critical support infrastructure.

In the report, NERC and the U.S. Department of Energy also issued a set of recommended mitigations for these vulnerabilities, which include the following:

- Document, implement and regularly update a cyber security policy that represents management's commitment and ability to secure its critical infrastructure assets;
- Ensure policies and procedures comprehensively include other parts of the enterprise, vendors, or contractors as appropriate;
- Implement strong procedural or technical controls at the access points to the electronic security perimeter to ensure authenticity of the accessing party (e.g., restrict remote access to field devices); Don't allow unauthenticated remote access to the control system;
- Implement physical security of network access points, including access control, or electronic methods for restricting access (e.g., MAC address filtering);
- Develop and implement policy for managing user and system access, including password policies; Change all default passwords where possible;
- Use secure communication technology when the Internet is used for sensitive communications (e.g., VPN, SSH, SSL, IPSEC)
- External connections should be controlled and secured with an authentication method, firewall, or physical disconnection when not in use;
- Define levels of access based on roles or work requirements. Assign access level and unique identifiers for each operator. Isolate user access to compartmentalized areas based on specific user needs;
- Use multifactor authentication (e.g., two-factor, non-re-playable credentials);
- Use proximity based authentication technology, such as RFID Tokens;
- Revoke authorization rights and access privileges of users upon termination or transfer; Automate removal of user accounts tied to badge systems or human resources upon employee termination;
- Remove, disable or rename administrator, shared and other generic account privileges including factory default accounts where possible; and
- Establish methods, processes and procedures that generate logs of sufficient detail to create historical audit trails of individual user account access activity.

Identity Management to the Rescue

The above "to do" list may seem daunting—and to many energy companies, it probably is. However, all of the recommended steps to compliance from NERC and the U.S. Department of Energy are based on real security technologies and policies that are in use today—and can be put into use within your company.

Given the shortened timeframe for complying with these regulations—and the fact that many in the energy industry have not started their compliance efforts yet, energy companies will need to look at solutions that are cost-effective, are not intrusive to the existing network or security environment—and are easy for users to work with. These additional requirements are leading many energy companies to closely examine identity management solutions as a way to jump-start their compliance efforts and improve the overall security of their organization.

With identity management solutions, companies can establish and enforce policies to reliably verify the identity of each user accessing the company's IT resources;

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they can enable policies to be established that govern how many users are permitted to gain access to IT resources; and can ensure that the identities of networked users, clients and servers can be verified without transmitting passwords over the network.

In order to get a full view into how identity management can help, let's take a more specific look at some of the top vulnerabilities that NERC and the U.S. Department of Energy identified and how identity management solutions can help energy companies answer the CIP standards:

- One vulnerability was that several energy companies were operating with inadequate policies and procedures for handling control system security. With an integrated identity management solution in place, energy companies are empowered to define, enforce and confirm (through auditing) that policies are in place, applied and enforced evenly across the organization. A strong solution can give an energy company a comprehensive way to track user access to buildings, networks and applications, automatically generating reports that show detailed logs of user access activity for fast and effortless audits.
- Another common problem on the list was that the networks that control access were inadequately designed and did not provide a deep enough defense against misuse. In addition, remote access was seen as a problem, as access control policies didn't always extend to mobile access. With identity management solutions, such as single sign-on, companies can implement strong procedural or technical controls at all access points to ensure that users are prevented from accessing the network or application unless they have the proper authorization credentials (which are based on their assigned role within the organization). These rules can be put in place for both on-site and remote access. Identity management solutions can automatically change passwords behind the scenes at regular intervals—and often can help ensure that external connections are controlled and secured when not in use.
- To further add to the defense against unauthorized network access, several identity management technologies allow multi-factor authentication to be enabled at an organization, tying network access together with tokens, smart cards or biometrics, for example. Network access can also be correlated with physical presence in the facility, adding yet another layer of identity authorization and protection for critical cyber assets. This is especially helpful in setting up a system to automate the removal of user accounts upon termination from both the facility access and the network access system.
- Another important aspect of complying with the CIP standards is ensuring that a proper notification process is put in place, so administrators are immediately made aware of any violations or anomalies. Identity management solutions typically see this as a must-have and include the ability to automatically generate reports and store activity logs that prove there was a violation of policy—and how severe it was.

An organization that employs identity management, access management, strong authentication and regular audits is often better equipped to identify system users, govern how each user accesses IT resources, keep user identity information confidential—and prove that security policies are in place and enforced—all helping to mitigate key control system vulnerabilities and support CIP compliance.

It is vital to remember, however, that technology alone cannot achieve regulatory compliance. The people leading the CIP compliance effort must clearly define policies and controls and follow the procedures to execute these controls. Technology's role is to support policies and automate processes, making it easier to establish and maintain compliance without putting an onerous burden on IT staff and users.

Meeting the CIP Challenge

With its detailed requirements, lack of best practices and looming deadlines, CIP compliance remains a formidable challenge for the entire energy industry. However, it also represents an opportunity for energy companies to gain greater control over their critical assets and facilities, to ensure policies and procedures are in place and followed and to improve service reliability for their customers. Identity management solutions can be essential components in achieving, maintaining and demonstrating CIP compliance—and in helping to ensure the safety and reliability of an energy company's critical infrastructure. ■

About the Author

David Ting is the CTO and founder of identity and access management company Imprivata. Named one of InfoWorld's Top 25 CTO's of 2006, David has more than 20 years of experience in developing advanced imaging software and systems for high security, high-availability systems. Prior to founding Imprivata he developed biometric applications for government programs and Web-based applications for secure document exchange at companies such as Eastman Kodak, Atex System, Delphax Systems and eCopyIt. He was also a member of the scientific staff at the BNR/INRS Labs in Montreal, a collaborative research institution jointly operated by Bell-Northern Research and University of Quebec. He holds six patents and has several patents pending.

R. Reid French, Jr.,
Executive Vice President & Chief Operating Officer

The 2008 Automation/IT Leadership Series

By Michael A. Marullo, Automation/IT Editor

Intergraph Corporation

R. Reid French, Jr., Executive VP & COO
Mark Doherty, Executive Director, Technology Architecture and Strategy

Mark Doherty,
Executive Director,
Technology Architecture and Strategy

The interview for this third installment of our Automation/IT Leadership Series for 2008 is with Intergraph Corporation. Headquartered in Huntsville, Alabama, Intergraph is a leading global provider of spatial information management (SIM) software. Security organizations, businesses and governments in more than 60 countries rely on the company's spatial technology and services. During and shortly after the GITA (Geospatial Information & Technology Association) conference held in Seattle in March, Intergraph's COO, Reid French, and Mark Doherty, Executive Director of Technology Architecture and Strategy, were kind enough to spend some time with me to share their thoughts and vision for the future. Like many companies, Intergraph is rising to the challenges of creating a more modern, more intelligent grid with emphasis on the security and mobility dimensions of a once again rapidly changing electric utility industry.

– Mike Marullo, Automation/IT Editor

EET&D: Intergraph is a company that has for decades pioneered many of the planning and implementation processes and operational procedures we take for granted today in the geospatial sector with literally thousands of installations worldwide. Like many, I still tend to associate Intergraph primarily with geospatial technology, but I've learned that Intergraph's focus has broadened considerably in the past few years. Perhaps you could give our readers a brief overview of Intergraph's SG&I Division, the part of the company that is most focused on the utility automation and information technology business?

French: Sure, I'll be happy to do that. The Intergraph Security, Government & Infrastructure (SG&I) Division is a leading, global provider of geospatially-powered solutions to the defense and intelligence, public safety, government, transportation, photogrammetry, utilities, and communications industries. SG&I customers rely on Intergraph solutions to organize vast amounts of complex data into understandable visual representations. Through our software, those customers are able to make better and faster operational decisions vital to the safety and well being of millions of people and to the success of thousands of businesses around the world.

EET&D: Most people would probably agree that we are entering a very uncertain period for energy and utility enterprises and also the suppliers they have come to depend on. As you look ahead to the next decade or so, what are some of the key drivers for the future evolution of Intergraph and how confident do you feel about that future?

Doherty: Clearly these are challenging times for the energy and utility industry as well as for those of us in the supplier community helping to lead the way forward. With so many elements of the marketplace in transition – infrastructure, workforce, security, sustainability and reliability, just to name a few of the most important areas – our confidence regarding the future is grounded in the fact that more than 500 utilities and communications providers worldwide are already using Intergraph's geospatially-enabled solutions to design and manage their networks and workforces. With that as a foundation, we continue to evolve our solutions for design, asset, outage and mobile workforce management to enable energy companies, utilities and communications providers to respond more quickly and efficiently to market opportunities, customer demands and regulatory requirements. And by drawing upon inherent strengths and a deep commitment to these markets, I believe that among our most important challenges as a supplier is to find ways to replace those uncertainties with sound, reliable and innovative yet affordable solutions.

EET&D: When I first became personally involved with the geospatial marketplace at the 1988 AM/FM International (the original name for what is now GITA) Conference, Intergraph's central market involvement and its leadership role were already well established. However, most large utilities were, at that time, just embarking on what I'll call their "20-year/$20 million" investments in geospatial platforms. Now, two decades later, those initiatives are substantially completed and utilities are looking for leverage from those hefty investments. Where

do you suggest that utilities should be looking for the best opportunities to realize benefits and capitalize on those investments?

French: Let me begin by giving you a general overview of how Intergraph sees some of the key elements fitting into the grand scheme of things; then, Mark can probably drill down to some of the more technical details…

Rising consumer demands, environmental concerns, security and the need to work smarter, faster and more efficiently are all foremost on utility executives' minds these days. The potential for extracting real value from past investments in automation and information technology relates not only to geospatial technology platforms but to many other aspects of a utility's automation/IT infrastructure as well. Intergraph believes that mobility is one of the most important areas where real-world benefits and a tangible return on investment can be realized from geospatial platforms when these tools are properly integrated and utilized.

EET&D: Mobility certainly has been getting a lot of attention lately. What is it that makes this mobility component suddenly seem so important?

French: Mobility is at the beginning of what promises to be an enduring trend toward moving what were once centralized applications into the field where the value is most apparent and provides the best returns. As more workers have jobs in field services, mobile solutions have stepped in to increase business productivity by allowing crews to receive work automatically and update the status of work from the road. Improving the productivity of mobile workers has an impact on revenue, expenses, customer service, and therefore, competitive advantage for utilities worldwide.

EET&D: Mark, could you perhaps elaborate some on how worker productivity figures into the benefits picture?

Doherty: Well, one means of improving mobile worker productivity is to unite mobile technology with outage management systems (OMS) and geographic information systems (GIS), so that field crews have access to the same maps and data as the dispatchers and engineers in the office. Unifying these capabilities equips field crews with a set of tools to handle all types of work from the road – such as field inspections, field design, vegetation management and damage assessment – and eliminates the need for multiple software applications.

EET&D: Where else can we take mobile data, now or in the future, that will yield tangible advantages without utilities having to commit additional large capital outlays or perhaps even allowing O&M costs to be significantly reduced?

Doherty: In addition to reducing lag time between job completion and new work order dispatch, mobile data access also reduces IT training and maintenance costs and increases the safety of field personnel by providing access to the most current information available for the work area. Integrating mobile applications with the corresponding business systems is an essential ingredient in successfully managing a distribution network; thus, improving operational efficiency and enhancing overall customer service.

Until now, field personnel have had to rely on several applications to manage routine tasks such as outages, inspections, repairs and connects/disconnects. A well conceived geospatial resource management platform solves this issue by facilitating integration of interrelated systems including geospatial information systems, outage management, mobile workforce management, and work management; all from within the vehicle in the field.

Moreover, field personnel can use one geospatial user interface (GUI) to receive multiple types of work, view and redline facility map data, share resources across departments, and communicate with back-office applications. All of the various workflows including design, inspection, damage assessment, viewing, routing and dispatching are supported.

EET&D: Are there other ways to leverage a geospatial platform to address additional challenges in the automation/IT area?

French: Yes, there certainly are. In addition to utilizing spatial technology for grid and outage management, we apply geospatial technology to the security field, helping some of the world's largest government and military organizations safeguard our infrastructure and way of life. Over time, I believe that utilities will come to leverage the investments that they have made in geospatial platforms to protect the very assets that we help them manage today. We are in the early innings of that trend, but I will say that I strongly believe it will become reality over time. The very best way to protect our infrastructure is through an integrated design, outage, control and security system based upon a strong geospatial platform.

EET&D: Why is it so important for utilities to embrace automation as we go forward?

Doherty: I think most people realize that as more processes become automated, there is a risk that the overall technology picture becomes more complicated. But in an age when we often require and expect data to be shared and connected, the differences in hardware and software that make those connections challenging must be overcome. Many organizations – especially those that provide our vital infrastructure, of which electric utilities are a critical part – must simplify and integrate their automated systems for instant, effective, and error-proof access to information.

With our critical infrastructure now in serious decline and the people upon whom we have depended for decades to support it retiring in increasingly larger numbers each year, a huge rationalization must take place in the next decade. This transition will very likely require vastly increased levels of automation, adding significantly to the complexities that already exist. Therefore, anything that can be done to simplify and streamline that process and move appropriate organizational knowledge into automated systems can save untold amounts of time and money at a time when both are in short supply.

EET&D: Asset management is another topic that seems to be on nearly every utility's "To Do" list these days. What do you see as the key challenges utilities face in say, the next 3-5 years, from an asset management perspective?

Doherty: Critical infrastructure – involving both fixed and mobile assets – requires long-term management that integrates asset and facilities management, security, and often, environmental compliance. Infrastructure management must address not only the complete life cycle of the assets, but must also track mobile and static assets in real time while improving uptime and availability, supporting rapid decision making, and reducing management and maintenance costs.

Sometimes achieving an appropriate level of integration across these various disciplines requires interoperability with products and/or systems provided by others. This will become even more important in the future as utilities move toward a more holistic approach to automated asset management while also embracing industry standards.

For example, our newest asset management software now supports Oracle Locator for storing geospatial data, allowing for greater interoperability among other corporate systems and further compliance with corporate and industry data storage standards. At the database level, this allows geospatial data to be easily integrated with corporate systems such as work management, outage management and network analysis to fully support planning, design, construction, operations, maintenance and emergency response functions.

EET&D: It appears that the road ahead for utilities might be a rocky one given the declining workforce and infrastructure issues we hear and read about so often today. What other kinds of tools do you see on the horizon that might help utilities deal with these looming problems?

Doherty: This might seem obvious to some, but there is a growing need for integrated data analysis and visualization tools. The tools that a lot of utilities are using today were developed years – and in some cases decades – ago. And although they might have been adequate in the past and are certainly familiar to the operating personnel, many of those tools are outdated and outmoded. Also, the newest versions of design and asset management software will make it simpler to take advantage of geo-facilities data throughout the enterprise by optimizing the incorporation of geo-referenced data maintained elsewhere into design and asset management workflows.

Simply having access to disparate data that emanates from multiple sources, either under one central database or easily incorporated via geospatial and database tools, creates a huge advantage in both time and money saved. Although some utilities have already implemented or are now implementing an integrated system of design, asset management and outage/workforce management technology, most still rely on a multitude of databases in many different places. This disjointed approach wastes time every day when employees try to locate information – some of which is never found at all even though it exists in some obscure location.

French: I think the reality is that with utilities facing a declining asset base, an aging workforce and a subsequent loss of intellectual capital while also getting constant pressure from regulators and consumers to operate better, faster and more efficiently, they will need better, faster and more efficient automation/IT solutions to thrive in the future.

EET&D: Is there anything else you can think of that would allow users to further leverage existing automation/IT investments?

Doherty: Combining outage and distribution management features such as trouble analysis and switching operations with mobile workforce management technologies such as computer-aided dispatch and mobile computing eliminates the need for multiple systems and allows for more seamless, intuitive scheduling and outage response procedures. For example, Intergraph users can now schedule routine service days or weeks in advance and also allow mobile users to rearrange their assigned jobs from the field so that the operations center knows the order in which they will be completed.

In addition, managers can also automatically elevate the priority of work orders for past due jobs that have not yet been completed, and during storms, can automatically remove routine work orders from crews' schedules in preparation for storm restoration efforts. Through the use of Intergraph outage management technology, some customers have reported that their interruption durations have dropped below the national average and that restoration times are significantly lowered.

EET&D: Reid, is there anything else you'd like to add to what Mark has said before we close this out?

French: Yes, I would just like to add that the advantages of a fully integrated outage and mobile workforce product and a complete design and asset management solution that seamlessly interoperate cannot be overstated. Until recently, these were merely interesting concepts, but now the technology has come together in a viable and readily available form. With the imminent need for a complete redesign of the power grid looming over the heads of utilities owners and operators, this integration could not have come at a better time.

EET&D: Well said, and thanks to both of you for sharing your time and insights with our readers. ■

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How Green Is Your Billing System?

By Guerry Waters, Vice President, Industry Strategy, Oracle Utilities

Around the world, utilities face increasingly strong pressure to help mitigate the negative environmental effects of electricity use.

This pressure is not entirely new. Over the past several decades, utilities have developed a number of programs aimed at environmental preservation. They have controlled power plant emissions. They have promoted appliance efficiency. They have added renewables to their traditional fossil-fuel generation mix.

Emissions controls have, of course, proved popular and widely accepted. The same cannot be said, however, of programs that raise prices significantly or that lower—in the consumer's mind—comfort or convenience. Despite consistent utility educational efforts, consumers rarely if ever choose a new home based on the efficiency of its appliances or insulation. Many consumers appear unwilling to invest in technologies like programmable thermostats, despite their high return on investment. Surveys consistently show high levels of public support for renewables, but when it comes time to buy them, few do.

In the face of customers' unwillingness to participate in environmental programs, utility employees can hardly be faulted if they exhibit a certain skepticism about today's renewed calls for environmental action. There is some evidence, however, that rising concerns about global climate change could trigger real change. Confronted by the potentially dire consequences of global warming, political leaders and industry regulators are once again turning to utilities for environmental leadership. They are asking for new and effective conservation initiatives, and they want utilities to do more than encourage conservation. This time, they want programs like demand response and critical peak pricing—programs reinforced through the billing system.

We Have Been Here Before

This is the third time in a decade that utilities have come under pressure to change their billing systems. Should they respond with significant changes in billing practices and business processes? Should they create a "green billing system?"

Ten years ago, utilities faced the challenge of ensuring that billing did not succumb to the Y2K problem. No sooner had they addressed that problem than the drive toward competitive retail markets began.

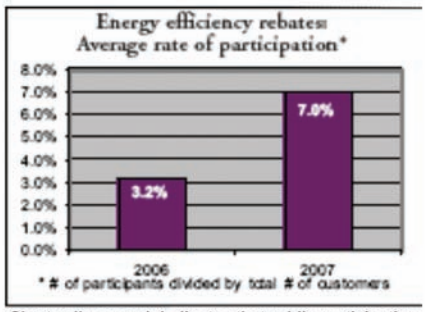
Not all utilities, of course, responded to the call for new billing systems designed to foster competition. And because competition developed slowly or not at all in most states and provinces, a number of utilities found reward in ignoring the pressure to change. Many, in fact, are happily using the same billing systems that have served them well for the past ten or even twenty years.

Are greenhouse gas concerns merely another fad? Should utilities ignore current calls to change billing fundamentals to accommodate new and rigorous conservation and efficiency programs? Or will those who attempt to ignore environmental pressures find themselves scrambling later to catch up?

Climate Change

It is tempting to downplay the potential effect of global climate concerns on the utility industry. The sometimes overblown rhetoric and doomsday predictions can seem almost silly to those who grew up with 1950s predictions of The Coming Ice Age.

It is increasingly clear, however, that global warming is not a fad. It is resulting in national commitments to dramatically reduce greenhouse gas emissions. Canada has already made such commitments. All three leading candidates for the upcoming U.S. presidential election have pledged reductions that vary across only a relatively narrow range.



Chartwell research indicates that, while participation in some energy efficiency programs may not be currently high, it is growing.
Source: Chartwell, Utility Trends and Best Practices in Energy Efficiency, *February 2008*

Even these commitments appear increasingly inadequate given new estimates that greenhouse gas emissions after 2050—little more than 40 years from now—will produce permanent and catastrophic climate change.

Barring practical technologies that can remove carbon dioxide from smokestacks and tailpipes, then sequester it permanently, the only path to slowing climate change lies in a massive and permanent reduction in fossil fuel consumption. As a primary user of fossil fuel, the electricity industry finds itself a major focus of public concern. Calls to action can only increase.

IN MEMORIAM

A TRIBUTE TO TWO OF OUR FINEST

Douglas M. Staszesky

3 November 1958 - 26 February 2008

Robert Gauthier

24 June 1958 - 27 March 2008

In the first few months of 2008 the electric power industry lost two of its finest; both to brain cancer at the age of 49. Certainly these were not the first – nor, unfortunately, will they be the last – colleagues we'll likely bid farewell in this still young year. But these men were special in that both were widely known and universally admired engineers that left a legacy of good work and good will to those of us who had the good fortune to know them in this life. They also served as excellent role models for those who follow. But beyond their professional careers and accomplishments, Doug and Robert were also personal friends that will be deeply and sadly missed by us all.

– Mike Marullo, Automation/IT Editor

Douglas Staszesky (49) died on Tuesday, February 26, 2008 at his Glenview, Illinois residence after a long battle with brain cancer. At the time of his passing, Doug was the Director of Product Management for all Automation Systems products and was responsible for customer service, application support and marketing at S&C Electric (Chicago, Illinois).

Doug was born in Wilmington, Delaware in 1958 and graduated from the Georgia Institute of Technology in 1981, with a degree in Mechanical Engineering. He joined S&C Electric Company in 1989 and held positions in Sales, Product Management, R&D, and Power Systems Services.

Prior to joining S&C, Doug worked at Public Service Electric and Gas Co. of New Jersey where he gained experience in line construction, distribution engineering, operations, planning, and the operation and maintenance of SCADA (supervisory control and data acquisition) systems.

Doug is survived by his wife, Jodi; a brother, a nephew and a large extended family across Maryland, Delaware, Massachusetts and Pennsylvania.

Robert Gauthier (49) died on Thursday, March 27, 2008 at the West Island Palliative Center, Pointe-Claire, Quebec, following a long battle with brain cancer. At the time of his passing, Robert was in the marketing department of TransÉnergie (Montreal, Québec), the Hydro-Québec transmission division, following a long career with the utility.

Robert was born in 1958 in Montreal and graduated from École Polytechnique (Montreal) in 1980, with an electrical engineering degree. After graduation, Robert began his career at Hydro-Québec in 1981 and led several automation projects and development initiatives at the utility prior to transferring to TransÉnergie.

He last served as the primary contact for the Langlois Variable Frequency Transformer project, a back-to-back HVDC converter station, and was also responsible for the commercial aspect of technology innovation for the TransÉnergie Division of Hydro-Québec.

Robert is survived by his wife, Francine; a son, Vincent; two stepsons; his parents, Louis A. Gauthier and Janine Ranger; a brother, two sisters, a stepbrother and a stepsister.

An Emerging Utility Agenda

Few utilities will find themselves able to ignore calls for their significant participation in the quest to slow climate change gains. Most will face increasing mandates to make major changes in fundamental relationships with customers.

In the last century, the utility mission focused on reliable universal service at just and reasonable rates. In this century, the mission is changing to accommodate products, services, and pricing that result in significantly lower energy use.

Few utilities—if any—will choose to gamble on the possibility that new scientific and technological discoveries will remove the conservation burden from their shoulders.

Search for Leadership

For the most part, neither regulators nor customers are clear about the best path to dramatically lower greenhouse gas emissions. They seek utility experience and help in evaluating and implementing programs to alter historic electricity consumption patterns.

Help is clearly needed. Anyone who has tried to stop smoking or keep a New Year's resolution to lose 10 pounds knows that behavioral change requires an initial catalyst, a plan of action, and continued positive reinforcement. Without all three, efforts to change will almost always fail.

We already, of course, have the catalyst: the threat of climate change. Few consumers, however, can readily define the correlation between reducing personal energy consumption and slowing global warming. Fewer still have access to the positive reinforcements that will make behavioral changes permanent.

The Role for Billing

What is most clear to utilities from experience is that half-hearted "education" programs have little if any permanent effect on electricity consumption. To make a difference, utilities must weave the conservation mission into fundamental business processes. And utilities' most fundamental customer-related process is billing.

The utility billing system or customer information system (CIS) can, in fact, play a key role in providing customers with a clear picture of the relationship between consumption and climate. It can offer options. It can help customers turn behavioral alternatives into habits.

Not every CIS, however, is capable of playing this role. In most cases, the customized legacy systems of the 1980s and 90s are far too inflexible even to begin to address conservation and efficiency programs in a meaningful way. Some of the lower-end vendor-produced billing systems are little better. Meeting emerging conservation and efficiency demands requires a robust and flexible CIS that changes readily, without customization or programmer assistance.

Evaluating Your CIS

To help customers maximize opportunities and motivation to reduce energy-related greenhouse gas production, your CIS should be able to handle:

- Multiple sources of supply so that customers can choose to purchase "green" electricity in whatever amounts they choose.
- Rates that vary frequently. Some studies suggest that varying flat rates monthly rather than annually[1] or semi-annually can substantially reduce peak demand. You can readily explore this option if your CIS permits rate changes without programmer intervention; ideally, rate changes can be "plugged in" via configurable tables that do not require extensive testing before the rates take effect. One of the most limiting aspects of a legacy CIS is rate-change inflexibility. Systems that require months to develop and test rates are simply untenable in an environment that increasingly requires utilities to help and encourage customers to conserve.
- Penalty rates. No one wants to force a neighbor into an asthma attack because the cost of running air filters becomes too high. But electric utilities will increasingly need to reexamine their long-standing practice of lower prices for high-volume consumers. As environmental concerns rise, a growing segment of the public may begin to advocate penalties on consumption deemed careless or excessive.
- Submetering. Both studies and common sense show consumers use less when they must personally pay for water and fuel. Single bills for apartment houses and condominiums encourage waste. Your CIS should not limit your ability to address customers individually.
- Time-of-use pricing,[2] which encourages customers to shift optional electricity use to off-peak hours. Time-of-use pricing maximizes use of base generation that, by definition, is always "on" and therefore always producing the same amount of greenhouse gases whether or not the resulting electricity is used. When customers make better use of base electricity, they almost always rely less on peak generation—generation that can be readily ratcheted back in response to lower demand. For utilities that rely on fossil fuels for peak generation, the result is almost invariably fewer total greenhouse gas emissions.
- Historic usage graphs. The CIS should be able to develop and insert these onto bills so that customers can track their progress over time in reducing consumption. Graphs should cover a minimum of 13 months. Even more useful for reinforcing long-term efforts is a CIS that can document two years of consumption and calculate averages that identify each customer's trend line.
- "Carbon footprint" analysis. The CIS should be able to show customers graphically the relationships between greenhouse gas emissions, their personal choice of supply, and, if appropriate, their time of use.[3]

[1] For instance, in "The Short-Run Effects of Time-Varying Prices in Competitive Electricity Markets," (University of California Energy Institute, CSEM WP-143R), Stephen P. Holland and Erin T. Mansur suggest that could be realized through setting flat rates monthly rather than annually. "Monthly flat rate adjustment has many of the same effects as RTP adoption, captures more of the deadweight loss than time of use (TOU) rates, and requires no new metering technology," they find.

[2] That is, segmenting consumption into three or four time "buckets," like peak, shoulder, off-peak, and weekend rates. Time-of-use pricing requires time-of-use meters that report separate consumption totals for each "bucket."

[3] Note, however, that, this analysis can lead to inappropriate customer behavior at utilities that use coal for base generation and natural gas for peaks. Customers switching from peak to off-peak consumption would, in this case, believe they were generating more greenhouse gases by using off-peak electricity. The CIS must be able to accommodate an adjustment so that customers do not attempt to lower their emissions profiles by switching consumption to peak hours.

- Bills in multiple languages so that all customers can be included in conservation and efficiency programs.
- Incentives and rebates. Utilities have long been involved in regulator-mandated rebate programs for, for instance, energy-efficient air conditioners or compact fluorescent light bulbs. Increasingly, however, regulators are requiring utilities to withhold payment until customers demonstrate an actual reduction in consumption. In these cases, the CIS must be able to analyze bills before and after the installation of the equipment subject to the rebate and release payment only to consumers who meet the minimum expectation of reduced electricity use.

Web portals help customers identify ways to control energy use.

It is particularly important that the CIS offer the option to include incentives either as a subtraction from the monthly bill or as a separate payment. There is currently no "best practice" as to whether such payments should be included on the bill or delivered separately. Utilities report varying responses to varying plans. Some see greater participation when they include the incentive on the bill. Others get better results by highlighting the conservation effort through a separate payment. As you gain experience with different programs and different customers, you will want to try out alternatives and compare results. Your CIS should not restrict your options.

- Customer analysis that accommodates demographic inputs from non-utility sources. While utilities almost invariably make incentives available to all customers in a class, there is far more pay-off in marketing incentives heavily to those most likely to use them. An apartment dweller using electricity only for lighting, home entertainment, and a few landlord-provided appliances is unlikely to respond to home insulation incentives. In contrast, utilities will obviously get better results when they market pool heating incentives to those whose county property records indicate that they have pools.
- Web portals. A CIS that populates individual customer Web portals helps customers identify use trends. Portals can then provide tools that let customers explore "what if" scenarios that demonstrate the effects of various conservation and efficiency strategies on their bills and their carbon footprint.

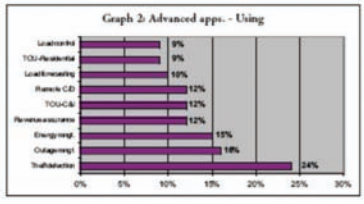
Interval Billing

The checklist above represents an array of relatively small changes likely to be required as regulators, utilities, and customers move forward with programs to reduce greenhouse gas emissions. Far more dramatic is the requirement now being addressed in California, Ontario, and elsewhere to implement interval metering and pricing for all customers including residential consumers.

Few if any utilities can accommodate universal interval billing with IT systems currently in place. Many lack even the software to handle interval or "complex billing"—a name that only hints at the depth and sophistication of its underlying software algorithms. And those with complex billing software in place—now typically used for large industrial customers—will likely find themselves overwhelmed by the onslaught of terabytes of new data that arrive when hourly meter reads replace twelve annual customer data points with more than 8,000. Most will want to offload the data into a Meter Data Management system that can make data available to many departments for use in outage restoration, dispatch, supply portfolio refinement, and other business processes.

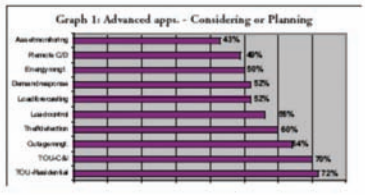
Despite the challenges posed by the need to handle massive amounts of additional data, interval billing greatly enlarges the scope of conservation options by enabling programs like:

- Demand response, which encourages conservation and appliance time shifting by increasing electricity's price during peak periods. A variation of demand response is critical peak pricing, which raises the price only occasionally, during periods of exceptionally high demand.
- Help with high bills. Graphs of interval bills readily reveal patterns of use. By training customer service representatives in the likely causes of and remedies for high usage during different times of the day or days in the week, utilities can help customers identify sub-optimal electricity use and adopt conservation alternatives. Utilities can make similar services available through individualized Web portals.
- Anomaly detection. Utilities that actively monitor hourly reads can readily expose and halt attempts at theft. They can also detect unusual consumption patterns that, for a household, might indicate a refrigerator inadvertently left running in a garage or a break-in at a supposedly vacant vacation home or rental property.



While relatively few utilities are using advanced applications like demand response, many are considering or planning them.

Source: Chartwell, AMI-enabled Demand Response 2007, *April 2007*



The Strategic CIS

Billing has always been a mission-critical operation for utilities. Today, it is rapidly becoming a strategic instrument that helps utilities and their customers address emerging environmental imperatives. ■

About the Author

Guerry Waters joined the Oracle Utilities Global Business Unit (previously SPL WorldGroup) in 2000. Previous positions include Vice President of Energy Information Strategy at META Group (now Gartner) and CTO and Director of Technology Strategy and Engineering at Southern Company. He focuses on IT strategies that help utilities meet their goals amidst changing customer demands, regulations, and market structures.

Clean Air & the Modern Grid:

The Challenges & Opportunities of Renewable Energy Alternatives

By Caroline Lofthouse, Communications Specialist
for Rodan Energy & Metering Solutions

Al Gore must be nitrogen's atomic enemy No. 1. Making up almost 80% of the air we breath, nitrogen receives little attention in comparison to carbon dioxide these days. Carbon footprint, carbon neutral, carbon offset, carbon sequestration, carbon trading have quickly been integrated into the lexicon of modern-day life. Increased environmental awareness has prompted many individuals and nations to reconsider the potential impact of everyday activities on the climate of tomorrow.

The electricity industry has understandably become a target of these concerns. Preliminary data suggests that power generation was responsible for 42% of the 5890 million metric tonnes of CO2 emitted in the USA in 2006 . In Canada, power generation was responsible for approximately 43% of all reported emissions for that same year . In light of these figures, renewable energy alternatives have quickly been gaining favour among regulators.

Renewable Portfolio Standards (RPS) have been established at the state-level while federal regulators edge closer to legislation implementing renewable energy across the nation. According to US Department of Energy, 26 states have mandatory RPS obligations with an additional 3 states setting voluntary standards. These standards vary between jurisdictions, with California and New York setting aggressive targets of 20% and 23% by the years 2010 and 2013 respectively.

The green shift is occurring north of the border as well. The Ontario Power Authority is proposing almost doubling the province's renewable energy by 2025 in so far that renewable power makes up 40% of the installed generation capacity. Canada's smallest province, Prince Edward Island, is targeting to meet its electricity needs using 100% renewable energy by 2015, thus eliminating the need for imports from out-of-province. Even hydro-rich Quebec is integrating 4000MW of wind power by 2016.

The greening of the grid is an integral part of 21st century's distribution system but a reduction in CO2 emissions is just one challenge facing system planners. In the digital age, North American economies are increasingly dependent on a reliable power supply for sustained growth. Power outages have a tremendous impact on the economy. It is estimated that the US loses from $119 to $188 billion annually as a result of outages and power quality issues. An hour long power outage at the Chicago Board of Trade in the summer of 2000 pre-empted approximately $20 trillion worth in trade. The Blackout of 2003, which cast the US Northeast and Ontario in darkness for up to two days, is estimated to have cost between $7 and $10 billion.

To ensure global competitiveness, the antiquated grid infrastructure must be updated to provide needed flexibility and reliability. As the technology and infrastructure facilitate the evolution of the Modern Grid or Smart Grid, large centralized generation will coexist with small-scale distributed energy sources such as a 25MW solar array or a 5MW wind farm.

The centralized linear generate-supply-consume model followed essentially since Edison had his bright idea will need to be replaced with a dynamic, interactive model which allows all participants a role in balancing supply and demand. The Smart Grid is designed to accommodate the needs of the technological age. This emerging framework will:

1. Provide real-time system optimization allowing the capacity to detect, analyze and restore system faults at the local scale;
2. Motivate supply-side participation through consumer education and enabling technologies;
3. Be more resistant to attacks through increased physical and network security features;
4. Resolve power quality issues before manifestation;
5. Improve integration of small generators and increase the proportion of renewable energy sources in the supply mix;
6. Optimize assets and efficiencies to minimize the need to build new generation and supporting infrastructure; and
7. Enable markets through open-access systems that offer consumers choice and create efficiencies.

The Smart Grid is a Green Grid by promoting efficient use of electricity and increasing the role of renewable energy in supplying consumer demand. As a result, investments in renewable energy sources have increased significantly. The US Department of Energy's Office of Energy Efficiency & Renewable Energy reported that global investments increased by 41% in 2007 reaching $117.2 billion. Almost half of that amount ($54.5 billion) was invested in wind power and this growth is likely to continue. Last summer, in the Renewable energy country attractiveness index, Ernst & Young predicted that investments in this sector could top $750 billion within 10 years. The United States was rated first in terms of attractiveness in all categories. Wind power has proven attractive to investors with a record 5021MW installed in 2007, bringing the nation-wide total to 16596MW of installed wind power spread across 34 states.

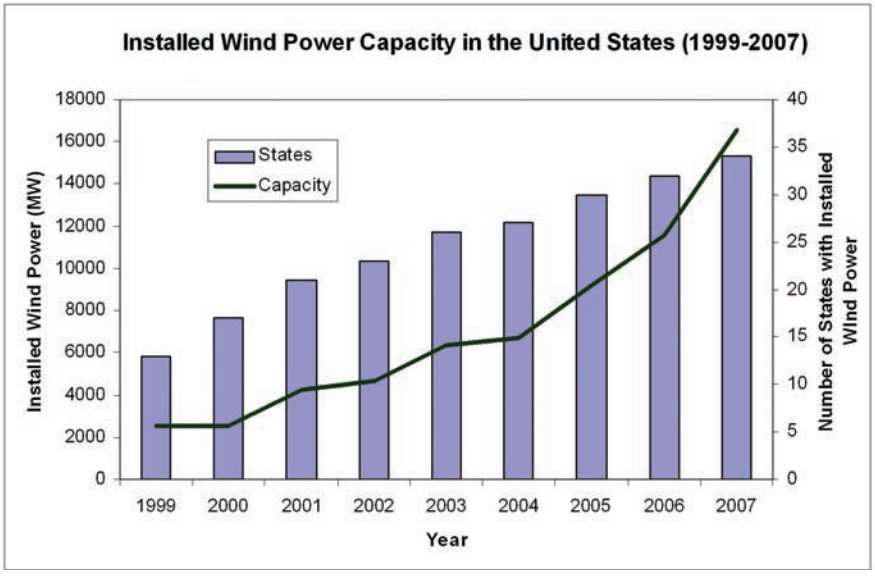
At present wind, solar power and biomass make up only 2% of the installed generation capacity in the US, with hydro bringing the total renewable supply to 13% of overall capacity. Yet in terms of net consumption, renewables supply only 9% of the electricity used by US consumers. Coal power on the other hand accounts for 32% of installed capacity, but supplies 49% of overall US demand. This apparent disparity underlines three critical challenges facing the widespread integration of renewable energy into the grid of the future, namely reliability, economics and location.

When the Wind Blows

Of the renewable alternatives in the supply mix, wind has proven most attractive to investors, yet there is often a large discrepancy between nameplate capacity and generation output. An industry standard suggests an efficiency value of 30%, indicating that a 1 MW turbine would likely generate on average 2628 MWh over a one year time period. The simple fact is that despite the use of wind forecasting to optimize wind power integration, the wind itself is variable and as such, presents various operational challenges .

1. Minimum Load: Times of high wind production may coincide with minimum load on the grid, requiring the system planners to reduce production from conventional power plants until supply and demand is restored. In some instances this may drop the spot price.
2. Ramping: Variations in wind can ramp up and down ±10 percent of capacity much of the time over the hour. However, variations are most prominent when output is between 25% and 75%. The largest variations are when the wind output is storm driven, reaching maximum output and reducing output quickly when the storm has passed.

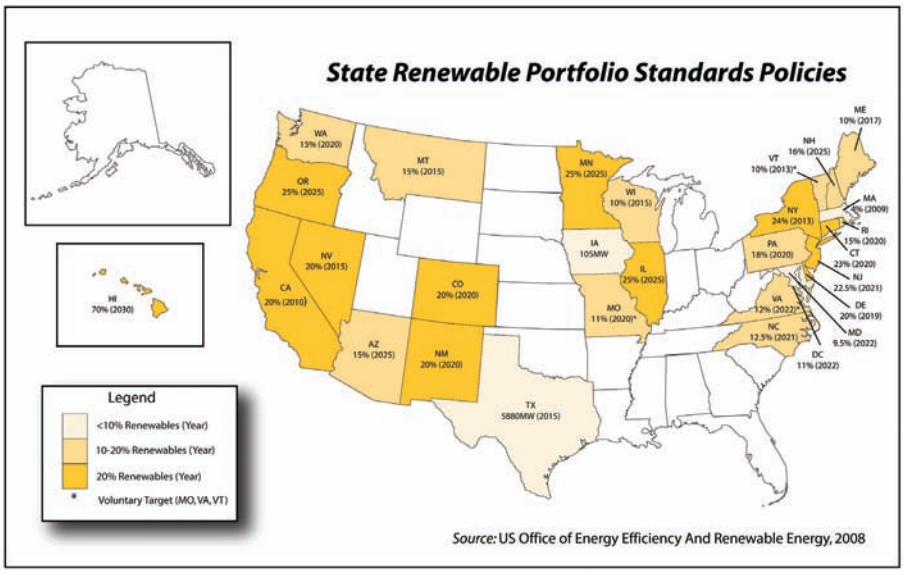
Solar power faces similar challenges. Although the sun will always rise tomorrow, variations in output due to cloud cover and the changing seasons promote an efficiency statistic of approximately 30%. The reliability of hydro-electric resources has also been questioned. Although historically reliable, the threats of climate change and potential shifting hydrological patterns have created concern among system planners about hydro-electric resources in the coming years.

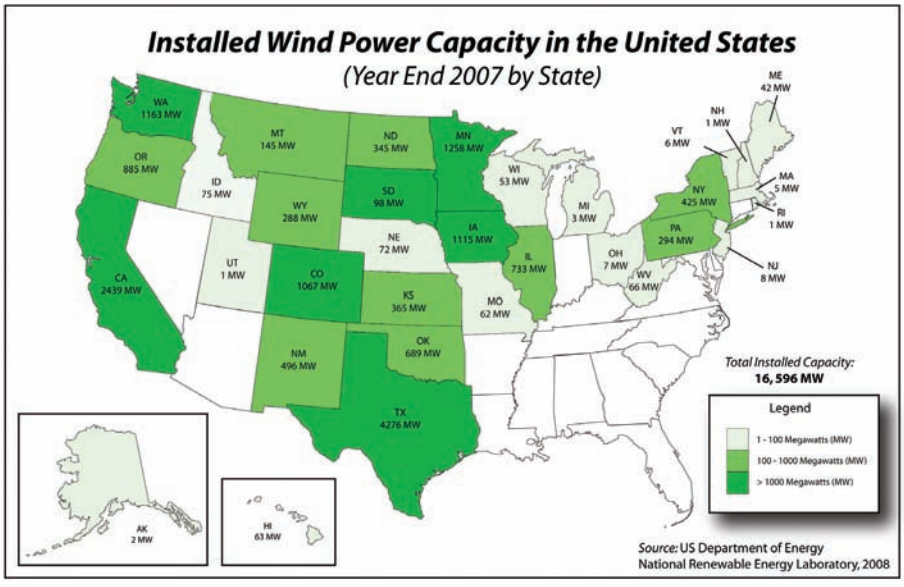


The Colour of Energy

Power on Demand could be the slogan of any system operator. Delivering electricity where and when it's needed is the mandate of Independent System Operators across North America. But just how much are consumers willing to pay to clear the air? Nuclear and/or coal power resources make up the base load of many existing North American electricity markets due to economics. Coal is cheap and reasonably plentiful and can easily be dispatched as demand increases. Yet coal power generation is responsible for 59% of the sulphur dioxide and 19% of the nitrous oxide emitted annually not to mention the carbon emissions. In an era increasingly dependent on electricity for economic sustainability, what price are consumers ready to pay for increased environmental sustainability?

While renewable energy has attracted much investment and federal, state and provincial governments have provided incentives to increase the percentage of renewable energy alternatives in the supply mix, this cost is ultimately going to be passed on to the consumer. How supply and demand will be balanced with increased prices for a resource seen as essential poses a challenge for market planners. Will a price for carbon offset the apparent price discrepancy between coal and renewables? If so, what criteria would be used to assign a value the carbon commodity? What impacts will such an action have on the economy and/or the environment?





A River Doesn't Always Run Through It

The integration of renewable energy into the modern grid is complicated by the spatial diversity of resources. The implications of this are two-fold. Firstly, the uneven distribution of solar, wind or hydro-electric potential inhibits the implementation of a national RPS. The have-not states would be required to import renewable energy to comply with minimum requirements. Secondly, this would be initially impeded by the required upgrades in transmission and distribution infrastructure.

New infrastructure is imperative for the Modern Grid and the integration of renewable resources. Increased capacity and spatially-distributed generation assets require a dynamic, interactive communication network that provides the flexibility and efficiency in distributing electricity. A case in point would be unscheduled power flows as a result of high wind production and low demand. With insufficient North-South transmission lines, the combined wind output of Denmark and Germany results in the transmission from Northern to Southern Germany via the transmission networks of the Netherlands, Belgium and France.

These challenges are not insurmountable but will require a pragmatic approach to balancing the green equation; a reliable power supply that balances the renewables with existing power sources to reduce greenhouse gas emissions. A critical component of this equation will be consumer response. Modern Grid technologies will provide consumers the tools with which to participate and address their primary objectives, whether these are lowering electricity bills, enhancing productivity or reducing their environmental impact.

The consumer holds the key to ensuring the integration of renewables into the supply mix. Conservation & Demand Management initiatives are becoming more prevalent, giving consumers options. Energy efficiency and load management provide a ready resource and alternative to relying solely on the conventional power sources. Demand response resources serve to complement the intermittent nature of wind & solar power alternatives. Environmental concerns have fueled the growth in renewable energy alternatives over the past decade. Efficient use of resources will be the driving factor of the Modern Grid. ■

About the Author

Caroline Lofthouse *is the Communications Specialist for Rodan Energy & Metering Solutions located in Mississauga, Ontario. As a Metering Services Provider licensed with the IESO, Rodan provides high voltage metering and power systems engineering services as well as a full suite of sub-metering, data management and settlement solutions. Under its EnerShift brand, Rodan has become the leading provider of demand response and energy efficiency aggregation services in Ontario. Caroline joined Rodan in 2006 upon completion of a M.Sc. from York University in Toronto, ON.*

Taming the Data Deluge

The Key to a "Smarter" Grid

By Jay Stinson, Intergraph Corporation
Vice President & General Manager, Utilities & Communications

As the term 'Smart Grid' has entered the mainstream, it has taken on many forms and interpretations, becoming the all-purpose utilities buzzword of the year. At the DistribuTECH conference in January, it seemed that practically every vendor in the Tampa convention center was hawking their Smart Grid wares.

Smart Grid technology continues to evolve and change the utilities industry. From automatic meter reading (AMR) and automated vehicle location (AVL) to critical infrastructure protection and load management, Smart Grid components are providing a way for utilities to control and manage their environment, and the challenges that accompany it. These "smart" or "intelligent" devices allow utilities to enhance network performance and reliability. Combined with communications and software applications, smart devices enable utilities to improve operational responses, reducing the impact and frequencies of power outages.

However, along with all of these new, "smart" technologies comes a deluge of data, making it difficult for electric system operators to monitor and control all of these applications and information at the same time. Due to this overwhelming amount of data, utilities can greatly benefit by adopting a single, integrated user interface that provides operators with a clear, overall picture. Bringing together all data from various devices in a way that is meaningful and easy to understand significantly increases the value of a Smart Grid implementation. "Smart" or "intelligent" technologies are no good without a smart operator who is empowered to make fast, well-informed decisions.

Power threats

There is a clear need for an intelligent network environment within the utilities industry. As costs rise and infrastructure ages, the demand for reliable power is increasing. Utilities must take security threats more seriously post 9/11. A CIA analyst reported in January that cyber attackers had hacked into the computer systems of utility companies in several regions outside the United States, in at least one case causing a power outage that affected multiple cities.

Outages cost utilities money and, at the very least, create inconvenience for their customers. Outages also cost the local and national economy. In 2000, a one-hour power outage at the Chicago Board of Trade disrupted trading and prohibited nearly $20 trillion worth of trade.

Some outages cannot be prevented, such as those created by storms. For example, hurricanes, damaging winds and ice storms can leave homes and businesses without power for weeks. While storms cannot be predicted, many outages are the result of aging equipment and loading problems. In February 2008, a system disturbance in south Florida led to the loss of power to a dozen plants and 26 transmission lines, and cut power to millions of customers. A fault at a substation was the starting point for the outage.

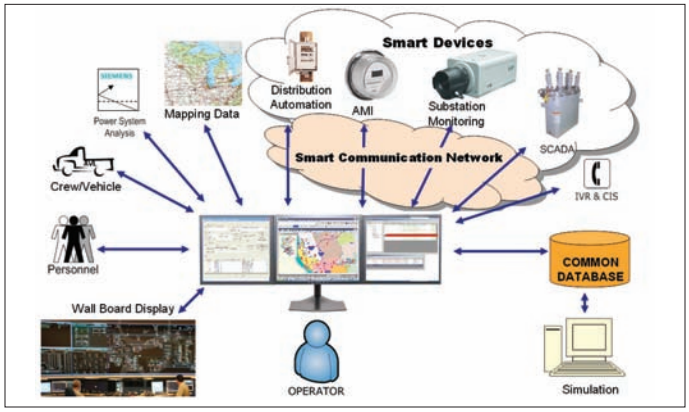


Figure 1 – Smart grid technologies include devices in the field, software applications in the operations center and a smart communication network that enables real-time network management and monitoring, ideally all integrated through one central command-and-control center.

There are also growing environmental concerns that could affect power production – whether it's conserving water or reducing the impact to our surroundings. For example, as a result of droughts in 2007, utilities in California and the Southeast had to cut hydropower output in half.

Regardless of the cause of an outage, customers want their service restored as quickly as possible. Utilities effectively managing their network and resources are in the best position to make sound decisions and respond rapidly.

Abundance of data

Utilities must meet the obvious challenges of cost savings and operational efficiencies. Additionally, the industry is facing demands to become "carbon neutral," incorporate renewable energy and limit or eliminate new plant construction. This compels customers and energy providers to manage power loads more effectively. Load management is the principal goal of a Smart Grid implementation.

The Smart Grid will integrate communication networks with the power grid to create a real-time view of the electric network capable of monitoring its own health at all times. The system can detect abnormal conditions and analyze the magnitude and extent of the problems.

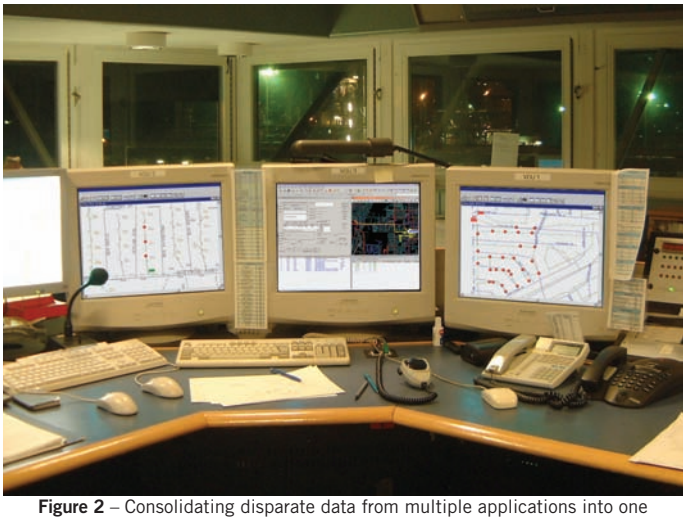


Figure 2 – Consolidating disparate data from multiple applications into one common operating picture is key to managing the deluge of data from smart grid technology. This centralized command-and-control center allows one operator to manage grid operations through a single application on just a few screens. When not consolidated, a utility may be using 7-10 monitors in separate locations with multiple applications.

As technology continues to evolve, various software components and meters enable more integration of the system grid. This automates many processes typically handled manually, while also allowing operators to detect and address outages and potential problems with the electric network. The capabilities of a Smart Grid expand rapidly as more devices are introduced.

Many utilities will integrate mobile workforce management (MWM) with outage management systems (OMS) and recognize immediate benefits. With the addition of distribution network applications (DNA) and a supervisory control and data acquisition system (SCADA), the utility has a smarter operations network. Broadband over powerline (BPL) and video/sensors are additional applications that can be implemented to give utilities a complete view across the enterprise.

Some Smart Grid capabilities include:

- Automatic meter reading, which helps reduce greenhouse gas emissions by reducing travel and fuel use
- Self-healing functions that support automatic adjustments in load flow and switching
- Trouble analysis reporting that can pinpoint the location and probable cause of an outage
- Mobile workforce management, giving operators the ability to "drag and drop" tasks onscreen to trucks deployed in the field
- Distribution management systems that support electric system operations

These operating tools provide utilities with massive amounts of data. However, there are often too many applications and too many sources of data for a single operator to manage. The abundance of information has the potential to create more confusion unless it is converted into intelligence that is easily understood. An easy-to-use operator console can help alleviate this problem.

Instead of monitoring the network with a SCADA system, making changes in an OMS, using AVL to locate a field resource, and calling the resource to assign a work order, operators of a truly "smart" grid should have all of this information presented to them in a single, integrated user interface. This will allow utility personnel to work more efficiently under both normal and storm conditions, as well as ensure they are using the most up-to-date, accurate information.

Bringing it all together

Smart Grid technologies include devices in the field, software applications in the operations center, and a smart communications network that enables real-time network management and monitoring. The addition of load and voltage information, video surveillance, access alarms, trouble calls and field reports can provide a complete picture of the network. However, all of this information can also overwhelm software systems and their operators.

One solution to the problem is to unify operating tools into a single command-and-control environment. In this environment, an integrated user interface gathers data from a variety of sources, converting it into alarms, events and work orders. Solutions such as the Intergraph® command-and-control environment for the Smart Grid is a means for bringing all of the data together – SCADA, OMS, MWM, distribution network applications, etc.

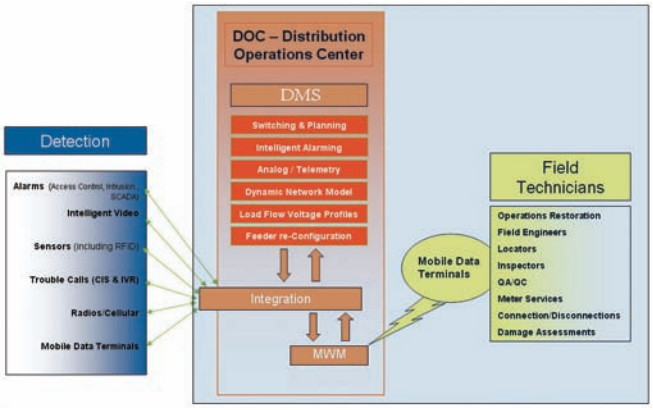


Figure 3 – For optimal performance of the Smart Grid, inputs from a variety of sources are tightly integrated to work together as one complete system.

The common user interface can play a vital role in improving operational response and reducing outage impacts and frequencies. Information that is easily understood enables better and faster decision making. A command-and-control environment for the Smart Grid provides real-time communications to ensure the right resources and the right equipment get to the right location at the right time. The solution can also assess storm damage and send information back to the operations center to expedite service restoration.

Benefits of an integrated environment

The integrated environment presents users with a single graphical view into the operational network. Traditionally, operators have been forced to work across multiple applications to get a complete view of their distribution system. With a console that integrates different elements of the Smart Grid, operators will no longer have to manage multiple networks and software applications.

Information and automation-enabled grid assets lead to more efficient operation and planning, better cost-to-value ratios for operation and maintenance and ultimately improved customer satisfaction via better outage management and performance. The solution allows utilities to prevent more outages, while responding more quickly and efficiently when there is a network interruption.

Operators and field crews are provided with views of the same maps, graphics and dispatch information with the integration of multiple smart grid technologies. By monitoring the entire network and field resources using a single console, operators and field personnel will experience higher productivity and increased safety.

A consolidated view of the entire network also:

- Provides the most up-to-date, accurate information
- Fuses OMS with geospatial and other data on infrastructures and assets, including transformers, utility poles, conductors, network devices, meters and other sensor data
- Provides easily visualized, actionable intelligence manifested in the form of alarms, events, work orders and other understandable activities, enabling quick detection and remediation of outages and other potential issues

"Traditionally, we have been forced to work across multiple sources of information, including paper maps, to obtain a complete view of our distribution system," said Raymond Rauber, vice president, engineering and operations, Enersource Hydro Mississauga.

"By working with Intergraph and Siemens to develop an Integrated Operating Model (IOM) for our power grid, we will be able to work more efficiently under both normal and storm conditions, as well as ensure that we are utilizing the most up-to-date, accurate information. The IOM implementation will allow us to meet the growing energy demands of tomorrow without sacrificing the exclusive service and safety we've been providing for the past 90 years."

A smarter solution

The components of a Smart Grid system provide utilities with more flexibility and increased success in meeting operational goals. Further, an easy-to-use console can maximize the benefits of a Smart Grid by making it easier to use for the multi-tasking operators who keep the power on.

Utilities can structure their Smart Grid to fit their unique requirements, realizing the greatest benefits by leveraging existing SCADA, DNA, OMS and MWM applications. Integrating software systems, communication systems and hardware systems is critical to recognizing operational improvements as utilities prepare for the future.

What will the electric utility industry look like in the future? The infrastructure will require more security, while utilities will be expected to make optimal use of their resources. Utilities will control more devices remotely. Additional customer choices and demands will require automated interaction with those customers. Utilities of the future will be expected to save energy and reduce greenhouse gas emissions.

Advancements in technology continue to improve the reliability of power delivery systems. New and improved software allows more coordination throughout the electricity grid. Modern grids can become more secure, more efficient, safer and less costly to maintain. The Smart Grid will play an invaluable role in helping utilities monitor the health of their networks and make better, faster, more informed decisions.

An easy-to-use console can maximize the strategic value of any Smart Grid implementation. With a single view, an operator can receive streamlined information from office personnel and field crews, as well as mapping data, system analysis and reports from various smart devices and meters. A unified command-and-control center can complete the true vision of the Smart Grid for the utility industry, which ultimately translates into providing more reliable power to customers without putting unnecessary strain on the world's resources. ■

About the Author

Jay Stinson is the vice president and general manager of Intergraph's utilities & communications and local government & transportation divisions, responsible for driving the application of Intergraph's comprehensive suite of geospatial solutions to these specific markets. Stinson has been with Intergraph since 1982, serving in various roles including vice president of enterprise engineering solutions and vice president of professional services. He also previously worked first-hand with many of Intergraph's most prominent utilities customers as a software developer and project manager.

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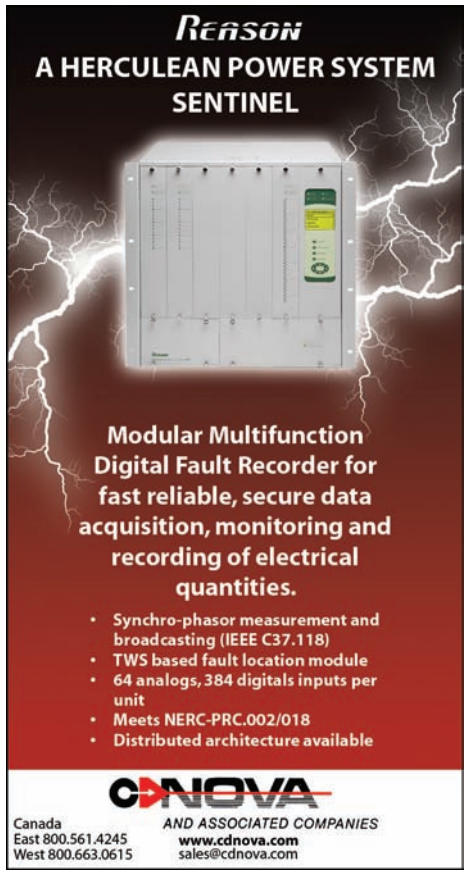

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