Electric Energy T&D MAGAZINE

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A Growing Danger:

The Risks Posed by Marihuana Grow-Ops

Plus

- Metering Showcase Section
- NRECA's TechAdvantage 2005 Conference & Expo

Volume 9, No. 1 www.electricenergyonline.com January-February 2005 Issue

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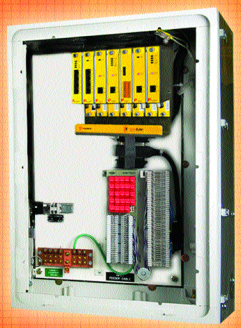

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Electric Energy T&D MAGAZINE

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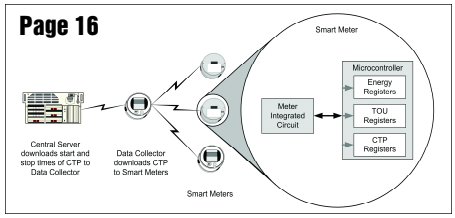

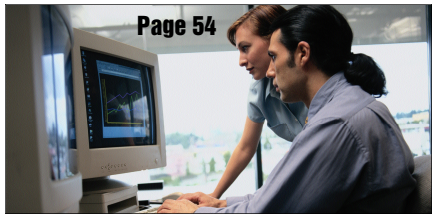

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Positron Expands Its Fiber Optic Isolation Portfolio

For the past 35 years, Positron has been providing reliable isolation equipment that protects communications circuits situated in high voltage corridors. Positron's Teleline Wireline isolators are 'passive' devices that protect copper facilities from the effects of Ground Potential Rise (GPR). With field proven reliability, the Teleline products have provided years of worry-free operations to our customers' critical infrastructures that include communications networks at power providers, telephone service providers, cellular service providers, emergency 911 PSAPs and other high voltage sites.

In early 2004, Positron announced the introduction of its TeleLite Fiber Optic Isolator. With the introduction of this 'active' technology, Positron has become the only provider in the market that offers its customers the choice of copper and/or fiber based isolation equipment to protect their critical infrastructures. Positron has continually evolved this fiber optic portfolio to expand the range of circuit functionality supported.

The TeleLite is made up of two distinct nodes in the customer network. The first node, located outside the Zone of Influence (ZOI) at the 300V point, is the Cable Fiber Junction (CFJ). This node converts the desired service onto an individual fiber pair. The second node, located at the user site, referred to as the Optical Equipment Interface (OEI), regenerates the services from the fiber. The customer data travels in both directions with one fiber pair for each interface card as depicted in **Figure 1.**

In January 2004, Positron introduced a range of Phase I services for TeleLite supporting:

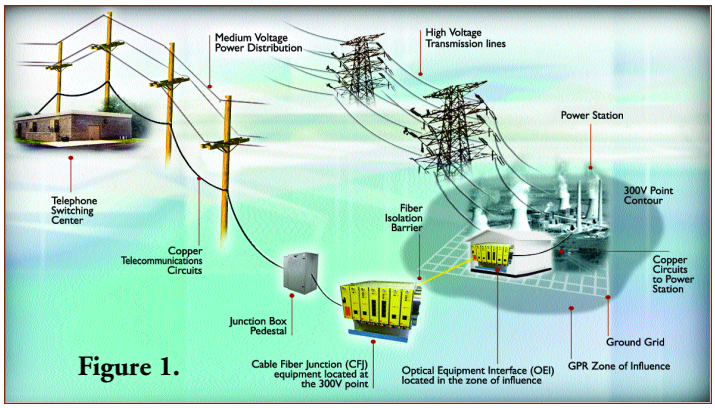

Figure 1.

- T1: This interface is powered from either the loop or a local source and provides a high density frame-relay service at a power plant or supports the Radio Access Network at a cell site or any other type of voice or data service that can be supported on a standard T1 interface.
- Quad POTS with Loop Start: Supports high-density POTS circuits.
- Quad 2Wire/4Wire Analog Data: High-density data for modem and SCADA RTU applications.
- 4Wire 56K DDS Data: This interface is powered from either the loop or a local source. It provides a DS0 circuit for a frame-relay circuit at a power plant or digital modem application with data rates as high as 72kb/s.

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Demand dramatic improvement— unify your workforce, assets and culture

LogicaCMG's Asset & Resource Management (ARM) suite provides the foundation utilities need to achieve dramatic business improvements. With ARM, companies can unify their workforce, assets and culture to reduce costs and better manage their business.

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LogicaCMG is a major international force in IT services and wireless telecoms. It provides management and IT consultancy, systems integration and outsourcing services to clients across diverse markets including energy and utilities, telecoms, financial services, industry, distribution and transport and the public sector. For more information, contact us at 1-800-334-7101 or see www.logicacmg.com/us.

SOLUTIONS THAT MATTER

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In June 2004, further features were added to TeleLite as Phase II, to support loop powered options:

- Line Powered POTS: Powered from the loop, this circuit supports a single POTS line using a single fiber pair.
- Line Powered 2Wire/4Wire: Powered from the loop, this circuit supports a single 2Wire or a 4Wire analog modem circuit, typically for a SCADA RTU functionality.

In October 2004, Positron introduced the Phase III features supporting:

- Dual T1: Support for one or two T1 circuits with this interface powered from either the loop or a local source; providing higher density on a single fiber pair and cost saving opportunity to customers as well as an option for future expansion.
- Quad POTS featured CLID, Ground start, & Loop Start
- Quad OPX (Off-Premise Extension)
- HDSL Classic, HDSL2, & HDSL4: Housing standard RTU cards from HDSL vendors, providing support for High Speed Digital Subscriber Lines into a power station or a cell site.

Currently under development are the TeleLite Phase IV features that will be available in March 2005:

- Ethernet 10/100 Mbps interface
- 4-Port Ethernet Switch supporting VLAN
- Support for Power over Ethernet (PoE)

Positron's TeleLite Fiber Optic Isolators support both Single Mode and Multi Mode fibers with either industry standard ST or SC connectors with a range from several meters to 16 kilometers. The TeleLite at the OEI can be powered from a standard AC supply or through the battery plant available at a power station (130V DC) or at a cell site (24V DC).

Positron's TeleLite portfolio is FCC-15 & FCC-68 approved, and is undergoing UL & NEBS compliance testing. With the extensive range of services supported by TeleLite, customers now have a choice of a flexible, cost effective and robust fiber optic isolator for deployment in high voltage environments. ●

For more information:
www.positronpower.com or 1-888-577-5254
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G&W Electric Celebrates 100 year Milestone

G&W Electric Company, Blue Island, IL USA is celebrating 100 years of service to the electric power industry. The company was founded in 1905 when Harry Gear and Paul Williams, two Commonwealth Edison engineers, had a better idea for connecting underground to overhead cables. The result was the first detachable style porcelain pothead, now referred to as a cable termination. Many new innovations followed as the company built their reputation on engineering expertise in providing quality products customized to customer specifications.

The company started in a small machine shop on Jackson Blvd in Chicago and moved numerous times within the Chicago area as the business grew. Today G&W headquarters occupies a 162,000 sq foot, state-of-the-art manufacturing facility in Blue Island, a southwest Chicago suburb. They also have a manufacturing facility in Shanghai, China. The company is both ISO 9001:2000 and ISO 14001 certified. They service a world-wide customer base through an extensive domestic and international sales organization.

G&W offers a variety of products. The original detachable pothead line has grown into a complete line of cable terminations and joints from 5kV through 800kV. Load and fault interrupting switchgear is available with either SF6 gas or solid dielectric insulation for underground and overhead distribution. Solid dielectric and magnetic actuator technology has led to flexible line of reclosers which can work with a variety of controls. Current limiting protectors are also available through 38kV, 5000A continuous and 120kA interrupting.

According to President, John H. Mueller, "We are extremely proud to be among the select few in our industry to achieve such a rare milestone. G&W has always been very fortunate to employ people with extraordinary talent, commitment and vision. Our products are designed, built and tested to the highest industry standards. Our longevity in the industry is a testament to the quality of our products. But a quality product is not enough. We realize what it takes to be a leader in the industry. We believe this strong foundation and our continued commitment towards customer satisfaction will assure our growth in the future. I personally want to thank all our customers and industry associates for their cooperation over the years". ●
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MDS Wireless Mobile Data Solutions for Field Force Automation

Empowering electric distribution and automation field service teams with an MDS wireless mobile data solution means more efficient operations, lower costs, decreased service windows and increased customer satisfaction. An organization's fixed network can now be wirelessly and securely extended to fleet vehicles and provide important, current information to the field where service teams need it the most.

MDS Mobile Data Solutions provide organizations handling mission-critical communications with superior coverage and high-speed throughput for both fixed and mobile services-all on one infrastructure.

MDS Mobile Data Solutions Provide:

- Long-distance coverage 2 to 10 times the range of other private, license-free wireless solutions; and
- High-speed data throughput 10 to 20 times faster than other wireless solutions-hundreds of kbps.
- Lower Lifecycle costs than other wireless solutions
- Lower deployment costs-less infrastructure is needed to achieve the coverage.
- Lower maintenance-industrial-grade, durable solutions with metal enclosures.
- Withstands brutal operating conditions and temperatures from -40° to +70° degrees Celsius.
- A private network with no monthly charges.

Based on your needs, either the MDS iNET 900® or MDS entraNET 900™ is provided in our Mobile Data Kits. In addition, we offer a family of leading-edge wireless products that are field-proven for all your wireless needs.●

www.microwavedata.com
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BECAUSE EVERYTHING CAN CHANGE IN A FLASH

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"January 9th, 2003, began like almost any other day -- but would end like none I've ever known. By midnight, I would be in intensive care, fighting for my life."

> "While working on switchgear, I took 14,400 volts and lived to talk about it."

"I was burned over 40% of my body ... had been airlifted to the nearest hospital ... and then transferred to a burn center. The prognosis was uncertain, but I was still breathing and still had a fighting chance.

If it hadn't been for the Bulwark protective apparel I was wearing that day, my burns would have been 3 times as severe, and no one would be reading this.

Believe me, everything can change in a flash.

And thank you, Bulwark."

Thomas Seeney

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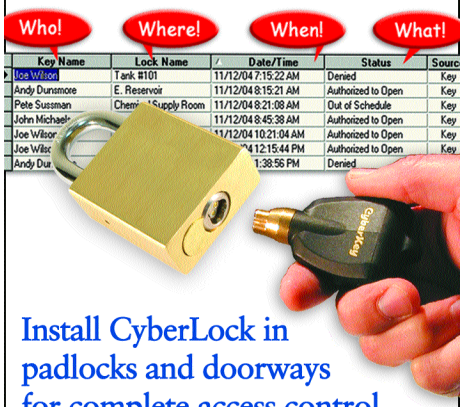

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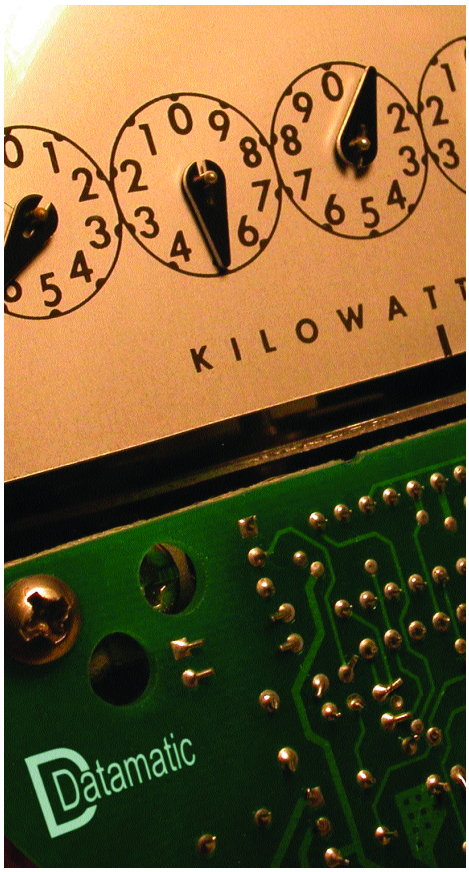
Datamatic wins Landmark patent for AMR system



The United States Patent and Trademark Office has awarded Datamatic, Ltd., a broad U.S. patent for its advanced Automatic Meter Reading technology. A leader in utility meter reading automation, Datamatic's innovative ideas pioneered an industry when it installed the first electronic meter reading system in 1980.

"For nearly a quarter of a century, Datamatic has been at the forefront in the design, implementation and support of advanced utility meter reading and field data collection solutions," said Datamatic President and CEO Ken Kercher. "We've always been innovators with new solutions that are rugged, easy to implement and flexible to make water, gas and electric utilities more efficient and effective."

More than 500 utilities rely daily on Datamatic systems. The technology allows utilities to prevent theft, monitor leaks, solve billing disputes and monitor conservation efforts.

According to Scott Durham, Datamatic Vice President of the Energy Systems Division, "The FIREFLY and ProfilePLUS technologies were a significant breakthrough for utilities as they're the building blocks for an AMR system which allows utilities to cost-effectively collect mission critical data for billing, operations, maintenance and power quality from just about any meter on the market. This patent award demonstrates the uniqueness, and ultimately the superior value, of the products and innovations available from Datamatic."

U. S. Patent, 6,798,352 broadly covers creating and storing of all profile information at the meter that is obtained by a remote user via a transceiver and which uses the unlicensed Part 15 radio band to transmit meter information. This exclusive protection provides a substantial competitive advantage for Datamatic AMR systems over competing technologies.

"There are two primary advantages that set FIREFLY apart from all other systems," added Datamatic's CFO Phil Masters, who headed up the patent initiative. "FIREFLY Meter Interface Units are compatible with virtually any water, gas or electric meter, making it the first truly meter independent AMR system in the industry. Secondly, all FIREFLY MIU's archive consumption data at user-definable intervals using a feature called ProfilePLUS. FIREFLY users have access to this data at every meter, all the time."

Each water FIREFLY can hold over 74 days of hourly consumption readings while electric and gas units can hold over 330. ProfilePLUS can be displayed in a graphical, spreadsheet or other meaningful format.

"ProfilePLUS is a tool for solving billing disputes and identifying leaks, as well as preventing theft and meter tampering," stated Mr. Kercher. "A utility can also use ProfilePLUS for conservation monitoring, maximizing operational efficiency and planning infrastructure improvements. This type of data was previously unavailable without costly flow monitors or network infrastructure."

Datamatic AMR System solutions (www.datamatic.com) include walk-by and mobile platforms. The combination of these platforms provides complete coverage for multi-utility data collection. Other products offered by Datamatic include the FIREFLY® Automatic Meter Reading System, RouteSTAR MVP® Enterprise Route Management software and ROADRUNNERTM Field Computers. The line of meter reading products is scalable and suited to utilities with 300 meters or 3 million.●

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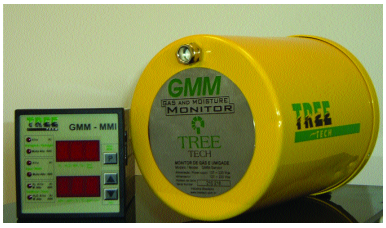
Flame-Resistant Relaxed Fit Denim Jeans. Carhartt's new FR relaxed fit denim jeans are made with the same strict quality standards and legendary ruggedness and durability that you've come to expect from Carhartt. Constructed with 14.75 oz. INDURA® Ultra Soft® denim, and styled with a leg opening to fit over work boots, the jeans are garment washed for extra softness and comfort. Carhartt's complete FR line is guaranteed to be flame resistant for the life of the garment. **For a closer look, meet us at Booth 1810 at the Tech Advantage Show in San Diego, CA (February 25-28). For more information or a catalog, call 1-800-786-3916.** All of Carhartt's FR garments meet ASTM, NFPA-70E and OSHA standards.

Circle 66 on Reader Service Card

On-line Dissolved Gas and Moisture in Oil from Tree Tech Digital Systems

Tree Tech Digital Systems, a global supplier of sensors and monitoring products for power transformers, provides the only solid state measurement device for on-line Hydrogen in oil measurement. Tree Tech's model GMM also includes moisture in oil measurements in the same unit.

The device features high accuracy, repeatability and reliability. The solid state measurement technology removes the pitfalls of other measurement techniques being utilized today.



Constructed with no moving parts and self-calibration, the GMM eliminates the need to monitor your monitoring system. The GMM is guaranteed to withstand full vacuum on the transformer without damage. Easy installation using the unique coupling system allows for a tight, upright sensor every time. This system allows the air bleeder tube to be at the top of unit every time for the most effective removal of air. The bleeder tube also serves as the port for off-line syringe type sampling of the oil for laboratory DGA.

The GMM's user interface houses displays for local visualization of the measurements in real time. The GMM samples the oil every 10 minutes and allows recording of measurements in its internal memory as often as every hour. Data storage capacity for 1800 measurements allows the customer to either download data in time intervals or poll the device using either Modbus or DNP3.0 level 1 protocol. The interface is compact as to allow installation inside existing control cabinets or it can be provide in a NEMA 4x enclosure. The interface features alarm contacts for high, high high and trend alarms for both gas and moisture parameters. Dual, programmable mA outputs and RS 485 output are standard for data transfer to SCADA or SAS system. The unit can also be equipped with a cellular modem for remote download/monitoring. Moisture parameters are displayed in ppm and percent saturation. Operating ambient is -40 to 85 degrees Celsius.●

For more information contact:
eM- info@treetechusa.com
www.treetechusa.com
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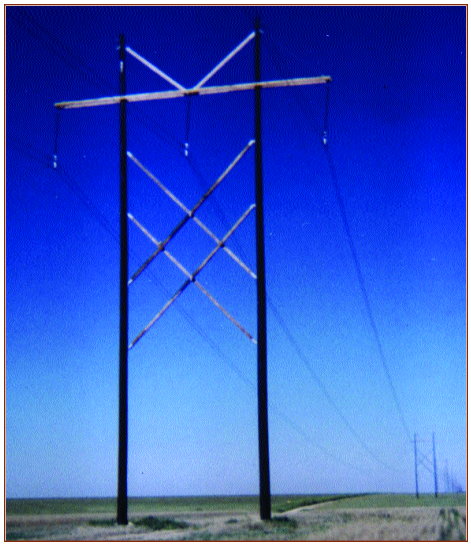
Xcel Energy Chooses Wood Poles for New 345 KV Transmission Line

Southwestern Public Service (SPS) and Public Service Company of Colorado (PSCO), operating units within Xcel Energy Company, are in the final stages of completing the construction of a 345 KV transmission line from Amarillo, TX to Holcomb, KS, to Lamar, CO. As a stipulation in the approval of the merger between SPS and PSCO, the Federal Energy Regulatory Commission mandated a study to determine the feasibility of interconnecting SPS's transmission grid with the asynchronous grid of PSCO. The resulting inter-tie project will allow transfer of power between the two electrically separated areas through a 200 MW, high voltage direct current converter station and will provide a substantial improvement in overall power reliability.

In early 1999, the companies planned the two-phase 345 kV tie line. Phase I ran from Potter County, Texas to Sunflower Electric's



power plant near Holcomb, KS. This section was energized in August of 2001. The second phase, Holcomb, KS to Lamar, CO is currently under construction and scheduled to be energized before the end of 2004.

The design engineers considered several materials for the transmission line structures including wood, steel and concrete. Wood pole H-frame structures were chosen for the tangent structures based on overall installed, life cycle cost, ease of construction and maintenance. Over 1700 structures, each using two transmission poles were required. Most of the poles were large class 90 foot and longer Douglas-fir.

The line angle, dead-end and a few other special structures were built with steel tubular structures on concrete foundations.

Both operating companies have extensive experience with wood pole construction having over 10,000 miles of transmission lines in their service territories. 90% of these lines are wood pole construction, some of which have been in service for over 70 years, and expected to continue in service for decades, another example of proven performance and longevity for wood pole transmission line construction. ●
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Solomon Corporation to Purchase Western States Recloser Repair

Solomon, Kansas -- Solomon Corporation announced it will purchase the assets of Western States Recloser Repair in Grand Junction, Colorado. The sale will be final on January 1, 2005. Solomon Corporation will continue to operate the Western States' Facility in Grand Junction and retain Western States' workforce. Melvin Sweatt, the owner and founder of Western States will be retained as a consultant for three years.

"I am grateful to the customers and employees that helped me grow my business over the years," said Sweatt. "As I look toward my retirement, I am pleased to have found a buyer who is interested in retaining our employees, is committed to serving our customers and has the expertise to build our business."

Founded in 1971, Solomon Corporation rebuilds, repairs and recycles transformers and provides related products and services to electric utilities and industry. It is the nation's largest Cooper Power Systems Authorized Service Center for transformers, reclosers and voltage regulators. The acquisition of Western States will allow Solomon to expand its geographic reach west of the Rocky Mountains. Solomon Corporation currently operates facilities in Solomon, Kansas and Decatur, Tennessee. It employs approximately 340 people with annual sales of over $40 million.

When it comes to transformer oils you have to take the longer perspective. The cost of the oil is normally just two percent of the initial investment. But knowing that the right insulating oil can add years to your transformer's lifetime, the initial cost may not be the most important factor. If you want to know more about how to increase your transformer's performance at a lower lifetime cost in the future, contact Nynas today.

\\ Expect more

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"We are committed to serving our new customers with the same great quality and service they have come to expect from Western States," said Tom Hemmer, Sales Manager of Solomon Corporation. "We will also be able to offer additional products and services to help electric utilities to deliver reliable power to their customers."●

For more information contact Tom Hemmer, Sales Manager, Solomon Corporation:

(800) 234-2867 ext. 179 or visit

www.solomoncorp.com

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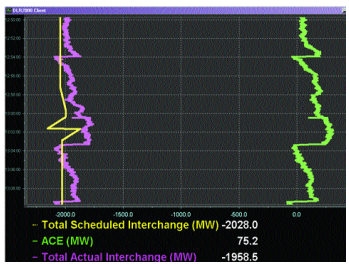
The Mauell DLR view



Dillsburg, PA: Mauell Corporation, a leader in control room system design and integration, announces the release of its newest product, the DLR View. The Mauell DLR View is a completely scalable data display, logging, and retrieval system that obsoletes archaic paper chart recorders and existing charting software programs available in the marketplace today.

Mauell developed the DLR View as a three part software system. It features a data logger that records input values (either analog or digital) to a central database, a retrieval function that loads real-time or historic data, and a Graphical User Interface or Client to select, identify and display the data values. This simple architecture offers a multitude of display configuration possibilities in the control room. Since the Client is completely scalable, operators can size the display to offer maximum readability. The DLR View can be launched on any type of display from local monitors at the operator workstation to a large video wall positioned 20 feet from the viewer.

The DLR View is designed to be extremely customizable. Operators can tailor their Client window to display an unlimited number of inputs or 'traces'. This allows the operator to select which traces are relevant to their monitoring responsibilities. Any analog or digital inputs such as ACE, Frequency, MVAR's, System Load, Total Generation, flow, pressure, or any other engineering unit can be graphically displayed as a Human-Machine Interface in real time. Background and foreground colors, horizontal or waterfall charting, legends, value ranges, sampling rate, meter bar, limit bands are all features that are managed by the operator.

Critical events can be recreated by retrieving historical data located in the database. This is a great training tool to assist operations, engineering and control room supervisors in identifying process errors.

The DLR View is a Windows" based program so it can be loaded onto any off-the-shelf PC running a Windows 2000 or Windows XP operating system. Mauell can supply a full compliment of PC, server and cabling hardware or incorporate a combination using your existing equipment.

Mauell will be showcasing the innovative and versatile DLR View at the 2005 Distributech and TechAdvantage trade shows, both held in San Diego, CA. ●

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As the market changes, we are continuing to change with it. We are now taking used silicone to reclaim and make in to a new quality silicone. While working with the manufacture of a natural ester (vegetable oil) dielectric fluid, for the first time in Canada we have retrofilled this fluid into mineral oil transformers. If the cost of petroleum based oil continues to rise, the vegetable based oil may become a more common alternative to mineral oil.

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A Growing Danger:

The Risks Posed by Marihuana Grow-Ops

By: Francis Bradley, Vice-President
Canadian Electricity Association, bradley@canelect.ca

The policy debate in Canada continues over the possibility of decriminalizing the possession of marihuana, media coverage and letters to the editor seem to indicate public opinion is becoming more tolerant of marihuana use. At the same time, the dangers associated with the cultivation of marihuana are becoming more acute. In a growing number of communities, marihuana grow-ops have become a serious problem, resulting in severe threats and risks to the public. Neither the public policy response nor the penalties imposed by the criminal justice system are taking into account the very real dangers these activities entail.

The proliferation of illegal indoor marihuana cultivation operations raises serious issues, well beyond the problems associated with the theft of power. Over the past couple of years we have witnessed an increase in organized, sophisticated multi-plant profit-oriented operations. The illicit profits generated are enormous and the involvement of organized crime is integral to these operations. In addition to the risks faced by utility personnel and law enforcement, these operations pose serious dangers to people living in or near them. Many operations contain power bypasses, which pose significant fire and safety hazards to the community.

The residential marihuana operations are increasingly sophisticated operations run by organized crime. Proceeds are frequently used to fund other criminal activities, such as the importation and trafficking of cocaine, ecstasy and heroin, the establishment of meth labs, or are laundered to be reinvested in legitimate businesses. Marihuana grown in Canada is distributed across the country to meet domestic demand, and a significant portion is also smuggled to the United States. Drug Enforcement Administration officials in Portland, Maine, report that Canadian-grown marihuana is sold in the region at up to five times the price of domestic and Mexican marihuana. Canadian marihuana sells for US$1,500 to US$2,000 per pound in Vancouver and between US$3,000 to US$8,000 in major American metropolitan areas.

Public Health and Safety Issues

Indoor marihuana operations enable growers to operate year-round and give them better protection from law enforcement and the criminal element than open-air marihuana operations. There are significant electrical and structural alterations needed to convert a residence into a high-yield, profit-oriented growing operation. These operations pose serious health and safety risks to the occupants of residences in which the cultivation occurs and, more significantly, to the community at large.

Growing marihuana indoors demands an amount of heat and electricity that is significantly higher than normal residential wiring and power supplies can handle safely. A large number of residential operations use electrical diversions or bypasses to circumvent utility meters in order to steal electricity. Bypasses are used to avoid the suspicion of utility companies and to conceal high electricity usage. In order to perform a bypass, holes are often drilled through the concrete foundation or walls to tap into the power lines. Through this bypass, the current generally does not go through fuses or circuit breakers, thereby removing safety controls on unsafe or excessive energy consumption. A household that operates a hydroponic lab needs three to ten times the power of an average home.

Bypasses are often performed by people who have little knowledge of electrical wiring or safe levels of usage. In B.C., from 1995 to 2000, there have been approximately fifteen electrocutions of growers as a result of improper electrical installations at grow operations.

In addition to electrical wire alterations and the diversion of electricity, marihuana grow-ops are often characterized by exposed live wires, high-intensity light bulbs and overheated electrical ballasts, used to operate fluorescent lamps, which are all significant fire hazards. Approximately one in ten bypass operations ends in a fire. These fires pose obvious dangers to surrounding communities, and overloading the power system can cause distribution transformers to overload, resulting in power outages in entire neighborhoods.

As well as considerable quantities of electricity, marihuana grow operations also require significant amounts of water, causing high levels of humidity within the residence. Constant high levels of humidity without proper ventilation can result in the build-up of mold, particularly inside walls and in insulation. Large indoor crops can also produce high levels of pollen within the residence. The continual high levels of molds and pollens can cause asthma, respiratory conditions and allergies in individuals who live or work in the residences. The emissions from a variety of chemicals used to grow marihuana rapidly can also cause respiratory health problems, particularly in children. Additionally, faulty rerouting of the residence's ventilation system and extensive indoor plant cultivation can cause the build-up of deadly levels of carbon monoxide.

The investigation and dismantling of growing operations poses a serious chemical and electrical hazard to law enforcement, rescue workers, including paramedics and firefighters, and municipal officials such as city housing inspectors and utility inspectors. Police drug units involved in raiding marihuana operations frequently wear full-length disposable suits and goggles for protection against fumes. Firefighters face hazards including unstable walls from structural alterations, dangerously high temperatures, electrocution or chemical traps.

Marihuana operations also pose significant dangers to electric utility crews who must repair the illegal electrical bypasses. The crew must dig deep down and disconnect the electrical bypass, a task that can lead to electrocution if live wires are touched. Furthermore, there is a significant safety risk to housing inspectors, contractors or future legitimate tenants.

In addition to the known potential hazards, there are more and more reports that some residences are equipped with booby-traps planted to protect the operation from other criminals or law enforcement. Structures have been found to contain spike traps or trip wires which activate harmful substances or electrical currents.

Increasingly, marihuana operations are being discovered in larger suburban houses located in upscale neighborhoods.

Violence is an integral part of profit-oriented marihuana operations run by organized crime.

Homicides and assaults are carried out to exert control over production and distribution. Across the country but particularly in B.C., home invasions accompanied with severe beatings are perpetrated to steal harvests. In the B.C. Lower Mainland, a number of homicides have been related to the marihuana industry.

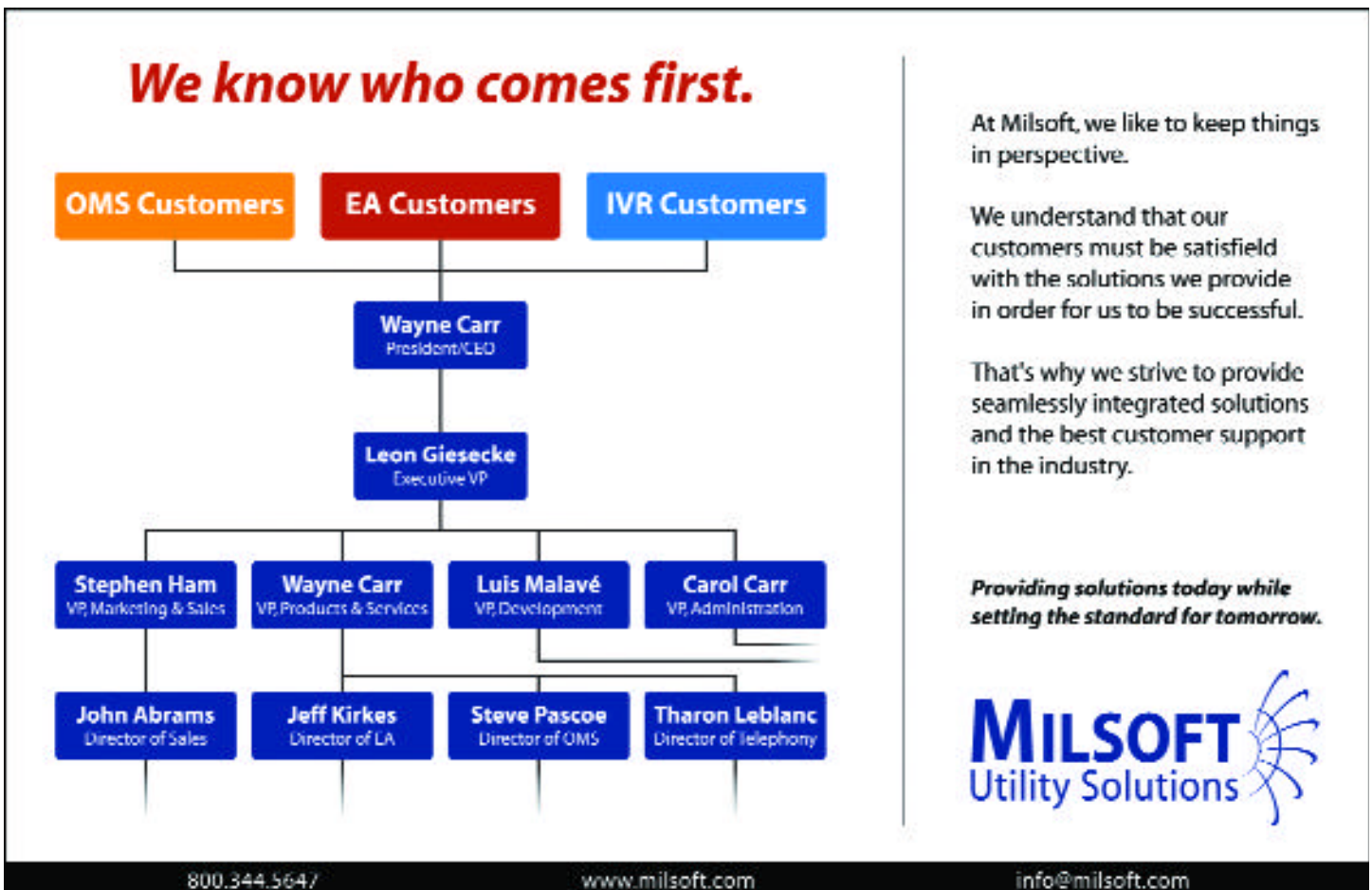
Organized crime groups will continue to be extensively involved in the large-scale cultivation and distribution of marihuana across Canada. Marihuana smuggling from Canada to the U.S. will probably increase if the demand for marihuana in the U.S. continues. Residential marihuana operations will continue to be a cost-effective and highly profitable way of growing large amounts of marihuana.

Concurrent with the continuation of residential marihuana operations will be the accompanying serious health and safety concerns. The number of children found living in residential marihuana operations is a serious and concerning trend. Similarly, the number of fires and violence related to marihuana operations is a public safety concern affecting entire communities.

How has the criminal justice system dealt with the grow-ops? Not very effectively if one looks at the research. A study by the Criminology Department of the University College of the Fraser valley which analyzed data for British Columbia from 1997 to 2000 found that a small number of cases result in significant jail time.

"Of the 11,733 cases coming to the attention of the police, 9,232 were fully investigated, and of these 8,010 proved to be founded. About half of these founded cases were dealt with informally (e.g., "no case" seizures), with this being a more likely outcome in smaller operations (i.e., under 10 plants). At the prosecutorial level, there are significant numbers of stays of proceedings and charges withdrawn as a result of plea bargaining practices, both of which result in a considerable attrition of charges and suspects…In the final analysis, 2255 of founded cases led to at least one offender being convicted. Overall, a total of 2551 offenders were convicted, representing 54% of those charged and 25% of suspects initially associated with a founded case. The majority of convictions did not result in custodial dispositions. Prison sentences were ordered in only 18% of cases, with an average term of 4.5 months."

Canadian law enforcement and other stakeholders are taking the issue very seriously. In Ontario, the Ministry of Public Safety & Correctional Services has assembled a stakeholder group to address the rise of grow-ops. The electricity industry in Ontario, through the Electricity Distributors Association is an active partner in the "Green Tide" initiative. At the national level, the Royal Canadian Mounted Police (RCMP) has been actively engaged on the grow-op issue and recently brought together a wide range of stakeholders at the first National Conference on Illicit Marijuana Grow Operations. A number of Canadian electric utility companies attended the conference, as well as the Canadian Electricity Association (CEA). Prompted by the serious economic and safety implications of grow-op electrical bypasses, the Canadian electricity industry through CEA has undertaken, in cooperation with other stakeholders, to examine more closely the possibility of establishing national guidelines to assist electric utility companies in identifying and addressing grow-ops. CEA is considering compiling an inventory of existing legislation and policies across Canada with the view of identifying best practices, which could be shared at the national level. Finally, CEA has identified as a priority the need to inform and educate the industry, as well as stakeholders, of the safety and economic impacts of MGOs, and will be investigating potential initiatives to address this. ■



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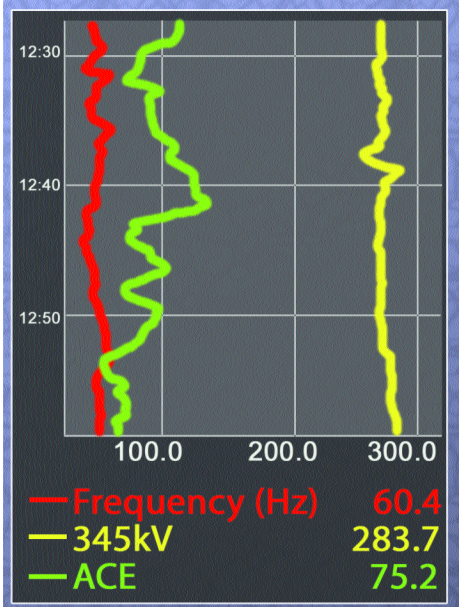

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Critical Tier Pricing

An objective look at the metering technology available for implementing critical tier pricing (CTP) programs

By Sharon Allan, Chief Knowledge Officer, Elster Electricity, LLC

There is ongoing discussion in the electric utility industry today on how to implement demand response programs that offer critical tier pricing (CTP) options to their customers. For the most part, the focus of these discussions has been on how to deploy demand response programs in an equitable manner across a customer base that has a broad range of energy usage habits. Missing from the discussions has been an objective look at the metering technology needed to implement critical tier pricing programs. This article looks at the pros and cons of two metering technologies available today that can be used to implement critical tier pricing.

One approach to implementing critical tier pricing is to collect interval data from a meter and derive critical tier pricing billing data at the head end system. This approach uses hourly load profile (LP) data from an interval meter or a simple energy meter with a communications module attached that collects pulse data from the meter. Typically, the communications module will also be able to communicate with the head system through nearby collection devices or a communication network. The other approach uses TOU register data from the meter with a dynamically changing TOU register dedicated to the critical tier.

When critical tier pricing is in effect, data accumulates in the CTP register within the meter. The meter typically has communications built into the meter so it can be updated daily if CTP time slots change.

CTP Using Hourly Interval Data from Meter Modules

Historically, interval data has been the method used for collecting daily load usage data at energy delivery points. The most popular use of interval data recording has been on large commercial and industrial (C&I) utility accounts and at delivery point substations.

Typically, complex pricing can be implemented using hourly interval data directly from a meter or from a meter equipped with a communications module that creates interval data. If a customer has a residential monthly billing rate with CTP, the head end system must collect 24 hourly intervals daily from the meter or module to compute monthly billing data with CTP using hourly interval data. This results in 720 interval data collections per meter every 30 days.

When the interval data is collected it is stored in the head end system. Before the data can be stored as billing data or sent to customers, a data validation, editing, and estimation (VEE) process is required to ensure the energy consumption is valid and has no gaps in the data. If a discrepancy is found, then a level of estimation and editing is required to account for the lost data. After the VEE process, the interval data is collapsed into the required CTP time structure based on the customer's billing rate. The VEE process in some systems takes hours depending on the number of meters.

If a utility offers a demand response program that reports load usage to their customers daily, the head end system calculates daily CTP usage and packages it for delivery to their customers via the Internet or by other means. The head end system also continues to do hourly interval reads on the meters while it converts interval data into billing data. In all, the head end system must have the processing power to handle data collection, compute energy consumption, perform VEE, and deliver data to the customer.

CTP Using Time-of-Use Meters with CTP Register

Electronic meters that have an additional CTP register can also be used to implement demand response programs that offer critical tier pricing options. These meters are programmable electronic single phase meters manufactured for use in residential and small C&I accounts. They have communications built into the meter, so they do not need any additional modules installed.

These meters collect and store the billing data in the meter so there is no need to reconstruct the collected data in the head end system. As CTP rates change, the meter collects and stores billing data for each occurrence in the appropriate register within the meter (see Figure 1). Since the head end system has two-way communications with the meter, the time definition for critical tier pricing can be changed daily.

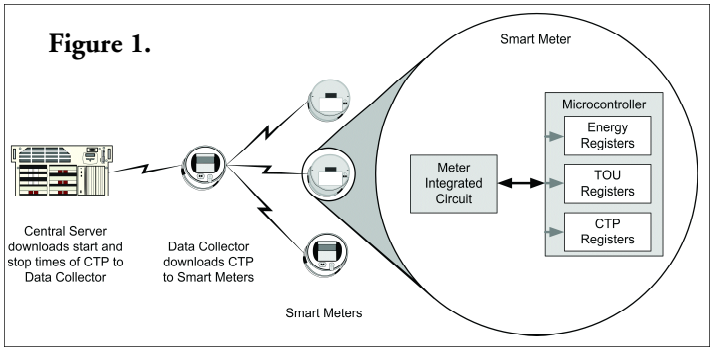
With this method, meters can be read daily or as required to provide data to the consumer. Since the data at the meter is billing data, the head end

system is not required to create billing data from interval data. All the head end system needs to do is deliver the CTP and other billing data to the billing system.

Comparing the Technologies

When using hourly interval data to implement CTP there is a significant increase in the amount of data the head end system needs to collect and process. If a residential customer has a CTP billing rate it would require the system to collect 24 hourly intervals per day for 30 days. This equates to 720 meter reads per billing period. This level of data collection results in a significant amount of data storage required. Additionally, collected interval data requires VEE processing to convert it to billing data. Concern that interval data may be lost or have errors has encouraged regulators to impose stringent requirements on utilities that use interval data with validation, editing, and estimation to bill customers. These requirements protect the consumer and ensure the utilities provide fair and accurate billing data. The raw certified meter data must often be archived for long periods (three or more years) to protect against billing disputes. This requirement impacts the long-term data storage needed, since the raw certified data is interval data and all intervals must be archived.

Figure 1.

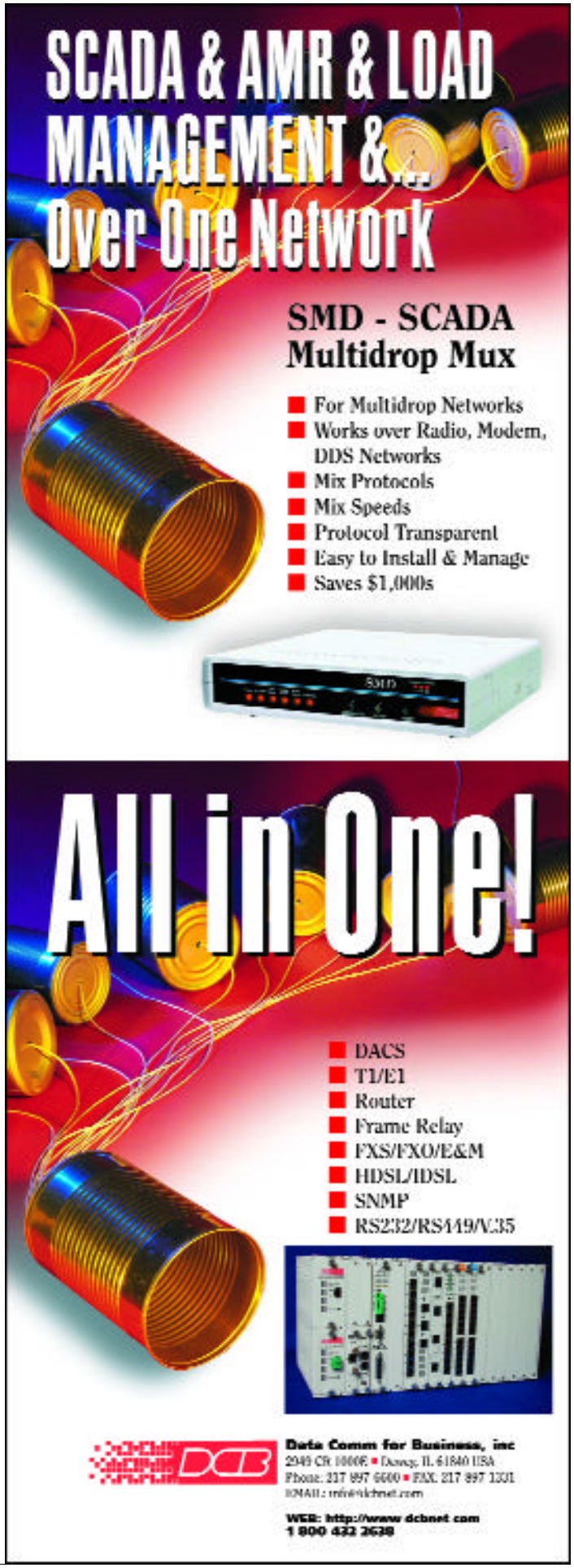


Looking more closely at how the data collection requirements compare, take the example of a customer on a two-tier rate (on-peak usage, off-peak usage) with critical peak pricing allowed on up to 15 events a month. Assuming interval data is being collected, the hourly interval data involves 720 meter values for the month (24 hourly interval values times 30 days). If a TOU meter that supports critical tier is used, then 75 meter values are required per month (2 daily billing values times 30 days plus 15 critical peak pricing event values). In this instance, almost 10 times more data collection is required for the hourly interval data compared to daily TOU data collection.

Other factors to consider are:

- With daily TOU meter data register collection, the head end system does not have to do VEE processing on interval data and convert the interval data into rate tier usage buckets daily for display to customers.
- Data storage requirements are significantly less with daily TOU meter data register collection. Only the TOU register data that is collected from the meter every month for billing needs to be archived. With hourly interval data, 720 data values are required to derive the monthly CTP billing data and all must be archived.

Meters that have a dedicated CTP register eliminate much of the processing needed by the head end system because billing data is stored in the meter's registers. Less communication bandwidth is needed so communication costs are reduced. If the meter is using a CTP register, only one meter read is required per day to collect the data. Since the CTP data in the meter is billing data and no VEE processing or data conversion is needed, data can be sent to the customer in a more timely manner. Additionally, the logistics



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of providing near real-time energy usage data to home automation devices such as programmable thermostats and control devices that monitor high-energy use appliances is simplified. These devices can receive real-time data directly from the meter.

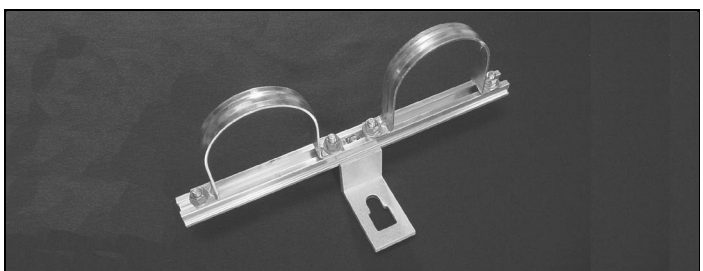
Simple meters with add-on modules require additional manipulation of interval data by the head end system. As the number of meters in the system increases, the need for the head end system to process more hourly load profile data introduces lag time in the system. This lag time could potentially diminish a system's near real-time capabilities as the number of meters serviced by the system grows. Smart electronic meters with a CTP register can provide billing data directly to the system in near real-time. The consumer can read their billing data at the meter and the data is readily available to home automation systems at the point of energy delivery.

What is the Cost?

The cost of purchasing a meter module for a simple energy meter is about the same as the cost of a smart meter with a CTP register. Additional fixed costs come into play if a utility company needs to add to or modify the communications infrastructure needed to support the metering technology. But the recurring costs using hourly interval data could be significant.

The following characteristics of using hourly interval data for CTP programs impact recurring costs.

- The communication bandwidth needed to transfer hourly residential interval data over the communication system.
- System processing power and time needed for VEE processing.
- System processing power and time needed to convert interval data into CTP data for the billing period.
- Data storage requirements for both on-line data and archival storage of raw certified meter data.



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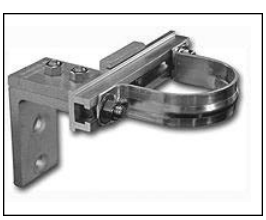

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Additional Impacts of VEE

While it is widely accepted by utilities that billing data can be computed from interval data, there is some inherent risk in labeling the computed results as billing data. When discrepancies are found between the collected interval data and the energy consumption seen at the meter, a level of estimation and editing is required to account for the lost data, and this is not typically viewed as billing data, but is considered modified data. There is also a time element of interval data. Any skew in the real-time relationship of interval data can have a dramatic impact on the computed demand and CTP data. Additional attention for validation, editing, and estimation is given to interval data in instances where the stream of data is interrupted somewhere in the process. Such interruptions may occur because of a problem with the meter, the pulse initiator, the recording medium, or in the data transmission from the field site to the central office system. Also, power outages must be distinguished from net zero consumption periods.

Validation verifies that the collected data matches the energy difference between the start and stop meter readings, and that the number of intervals collected matches the reported time between data collections. If any of the validation procedures fail, estimating and editing of the data is required. Very complex procedures are used by utilities to estimate lost data. Same-time data from similar accounts, same-time data from previous days for the same account, the average of the last several days' data and the same-date data from a year ago, plus other variations, have all been used to estimate the missing data.

Conclusion

There is a mutual understanding in the industry that utilities must be able to measure and track each participating customer's energy consumption to successfully implement demand response programs. The meter must be capable of knowing what critical tier pricing rate is in effect so that it can accurately "bucket" the energy usage. Implementing near real-time pricing (RTP) for customers that have home energy management systems requires that the customer's meter have the energy usage data readily available.

Obviously, CTP, demand response, and real-time pricing programs can only be successful if the technology can deliver energy usage data in near real-time. This may warrant a closer look at each of these technologies to see if they can perform to both the energy provider's and the energy consumer's expectations. ■

About the Author

Sharon Allan has responsibility for strategic initiatives, third party relations, product management, regulatory affairs, and new business development for Elster Electricity, LLC. In addition, she is a member of the division patent committee overseeing the protection of intellectual property. In 2002, Sharon was named one of the '50 Key Women in Energy' for her global leadership in the area of innovation and creativity. Sharon has been a presenter for Edison Electric Institute, Metering International, and AMRA meetings, as well as other energy industry forums. She is a board member for Metering Americas and National Energy Marketers. Sharon can be reached at sharon.s.allan@us.elster.com

Sharon has an MBA from the Fuqua School of Business at Duke University. She earned a degree in electrical engineering from the University of Florida. Sharon has completed post-graduate electrical engineering courses at NCSU and University of South Carolina.

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Demand Dramatic Improvement Through Better Asset Utilization and Workforce Unification

Part 1

By: Chuck Drinnan, Executive Consultant, LogicaCMG

Utility shareholders and regulators are demanding dramatic business improvements in a corporate environment that limits the utility's options. Today's utilities are smaller, leaner companies facing fixed utility rates, more regulations, and increased insistence on better performance from existing resources and assets. The demands on senior management have increased while the opportunities for quick results through staff reductions and process improvements are limited.

Some utilities are making minimal investments and talking about continued process improvement – doing what they are doing now, but doing it incrementally better. However, incremental changes won't make the substantial improvements that senior management and company shareholders are expecting.

Leading utilities are not settling for incremental improvement. They are seeking dramatic improvements through unification of their asset, systems and data. They are rethinking who they are, what they need, and how they do their work. If they don't, they will be left behind by those who do.

Utility managers are realizing that they are asset owners in asset-intensive companies. As owners, their objectives are to maximize the utilization of their assets. This leads the owners to ask different questions than their predecessors did, seek new performance measures, and require new asset-oriented systems.

In Part I, of this two-part series, we will review the questions asset managers are asking and why a new asset registry capability that determines asset life cycle history and accumulated costs is required for business improvement. We will also discuss applying a new investment measurement, Return on Asset Investment (ROAI), to compare potential investments in different assets. ROAI considers the value of the assets in producing revenue.

Traditionally, utilities have been organized along capital and operations activities in the office and the field. Enabled through the implementation of "best-of-breed" systems, this culture results in organizational silos that prevent employees from operating at their fullest potential. As utilities recognize these silos and seek to remove them, they can operate more effectively as a unified organization.

Part II of this article presents a recommendation for the unification of office and field capability as a method to reduce costs and make the office and the field more effective. Unification requires organizational, cultural, and system changes. By moving more office capability to the field and aggressively removing barriers between the office and the field, utilities can make dramatic productivity improvements.

The relationship between the utility and its contractors is similar in many ways to the relationship between the office and the field. By expanding access to corporate systems to the contractor, in the contractor's office via the Internet, the contractor's role can be expanded, redundant effort eliminated, and the overhead of contracting minimized.

In short, utility organizations can make dramatic improvements by focusing on their existing assets and unifying their workforce. New systems and cultural changes are required to reduce costs and achieve the full potential of the utility workforce. This article discusses both.

Utilities – Asset Intensive Companies

In a utility that has generation, transmission, distribution, and retail segments the transmission and distribution segments will spend most of their revenues on the extension and maintenance of the utility network – that is, the utility's assets. These regulated business segments (Wires and Pipes) acquire and maintain assets rather than generate or sell energy. As the utility environment continues to change, the managers of these business segments are recognizing that they are managing

> The top five US electric and gas utilities have over 130 billion dollars of combined property, plant, and equipment assets.

asset-intensive companies and asset ownership is their core business. Even vertically organized utilities, with all the business segments present in a single company, spend most of their non-energy acquisition budget on their assets.

As asset owners, the regulated utilities face conflicting issues:

- Demand for profits and ROI
- Retiring institutional knowledge
- Increased reliability requirements
- Performance based rates
- Aging infrastructure
- Reduced capital budgets

Asset Managers Ask Different Questions

Managers who have recognized the importance of asset management are exploring ways to measure return on asset investment, extend the useful life of their assets, and better utilize their existing assets. They are also changing the way they deploy their resources, what they expect of their resources, and how they measure asset impact.

Utility managers, motivated to manage their assets better, ask questions like:

- What is the full life cycle history of an asset?
- What impact does the asset have on delivery of energy and revenue production?
- What expenditures has the utility made on the asset?
- What is the return on asset investment?
- How can the maintenance and inspection budget be allocated to increase asset life while maintaining reliability standards?

Asset Life Cycle Components

To answer these questions, asset managers need data that is captured and organized differently. For each asset, they need to know each life cycle event, its associated costs, and its effect on the asset's reliability and expected life time. With this history, managers perform an asset oriented analysis to drive asset based decisions. Asset life cycle history should include:

- Implementation including cost of equipment and installation prorated to the individual asset
- Design parameters – the distinguishing features of the asset and the engineering parameters required for detailed analysis
- Compliance, inspection, and maintenance events including the evaluated status and associated costs
- Asset utilization parameters and events (sometimes called condition factors) – faults, loads, power factors, etc.
- Maintenance procedures performed on the asset and associated costs – refurbishments, treatments, reconfiguration, etc.
- Special environmental conditions (temperature if unusual, salt water conditions, etc.)
- Decommissioning events and associated costs

Since the information is organized by asset, the cost of operations that are performed on several assets should be prorated in a consistent and meaningful manner to the individual asset.

Life Cycle History Drives Cost Reductions

The asset life cycle history provides the raw data that drives an analysis that helps determine:

- The most cost effective manufacturer based on the total cost of ownership for new asset purchases
- Configuration changes and how they affect the expected life of the asset
- Maintenance procedures and budgets that meet compliance requirements, reduce costs, and increase asset useful life times
- Replacement strategies – if the status of the asset indicates it has minimal degradation, should the utility replace the asset as it nears the end of its design lifetime?

Measuring Return on Asset Investment

Return on Investment (ROI) is a popular financial measurement used to determine whether an investment should be made and which of several investment alternatives offers the most financial benefit. ROI compares major projects such as acquisition of a new system, the extension of a gas main, or the implementation of a pole life extension effort. ROI is based on best guess estimates of future productivity, value appreciation, etc. Uncertainty is often part of the consideration and is compensated for by the mangers who perform the assessment.

Return on Asset Investment (ROAI) is a different measure that helps evaluate the relative importance of different asset investments. While ROI is typically a measure of the value of a complete project, ROAI is used to compare asset alternatives within the context of a larger project.

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A Maintenance Example Using ROAI

For example, suppose your company has decided, based on an ROI analysis, to invest in increased maintenance. As a regional manager you want to apply that investment to provide the most ROI by determining the most effective maintenance (or replacement) strategy for each districts. You want to determine a more reasoned strategy than giving each division an equal share of the budget. ROAI provides a consistent, objective way to compare the long-term impact of various operations on the assets in each division.

ROAI provides a consistent, objective way to compare the long-term impact of asset operations.

Suppose investing in the maintenance of a particular type of facility reduces the probability of failure for ten years and also extends the facility's expected life ten years. Other maintenance procedures for different assets offer different advantages. With a limited budget, the problem is to determine an optimal maintenance strategy for all assets in order to maximize the ROAI. The comparison is between doing nothing to an asset against doing specific maintenance to selected assets.

One component of the value of performing the maintenance is the cost avoidance of buying and maintaining a new asset over the additional expected life time minus the cost of implementing the maintenance. However, there is more to computing ROAI.

If the asset is critical to a sub-transmission line located near the substation, it is more valuable than the same asset controlling the energy provided to the local dry cleaners. It may be the same type of facility but the impact of a potential failure is dependent on the use of the facility in the network. The impact is also a function of the level of redundancy in network paths and the time required to repair the asset or reconfigure the network. Thus the manager should consider the reduced probability of asset failure and the cost avoidance of the failure if the asset is better maintained within the context of the network.

Some utilities offer different grades of service at different rates. The value of the asset can also consider the revenue of the downstream customers prorated to the asset.

Not surprisingly, the general result of the complete ROAI analysis is that the most expensive facilities and those that are responsible for more downstream load (or downstream revenue) will be maintained first. However, once these facilities are maintained and the probability of failure for these facilities is reduced, other facilities with less impact will offer further ROAI and they can be scheduled for maintenance. The strength of the ROAI calculations is to determine various tradeoffs for the expenditure of a finite pool of dollars, based on a technical analysis rather than time-based maintenance that treats each asset as having equal importance.

RCM

Reliability Centered Maintenance as proposed by EPRI and implemented in some utilities considers the impact of the reliability of the network in determining when assets should be maintained and what procedure should be used. It has proven effective for substations and generating stations as well as distribution.

This example is a variation on Reliability Centered Maintenance or RCM. The difference is that instead of using reliability as a measure of the value of a maintenance strategy, the ROAI investment uses evaluated cost avoidance.

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Asset Oriented Systems

Most utilities have a wide range of systems that were developed to manage specific aspects of the life cycle of their assets. These are mature systems developed over the last twenty years and typically they perform their functions very well. See Figure 1.

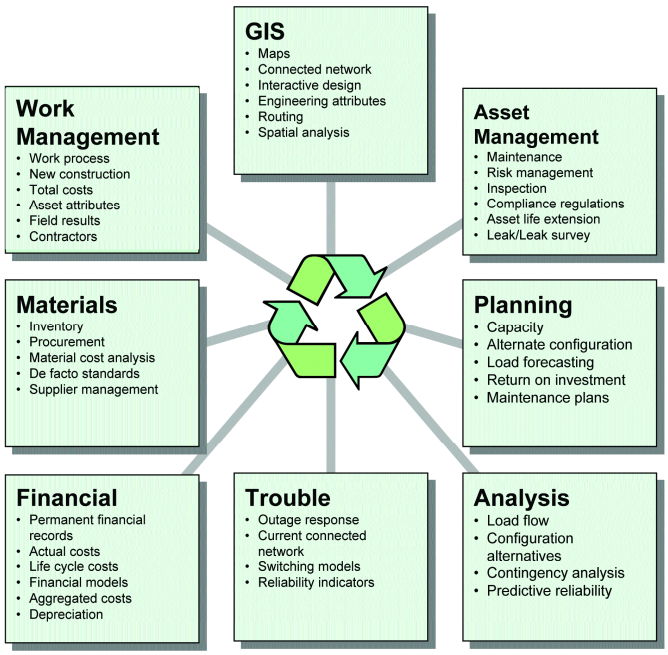

Figure 1: Systems That Manage Assets and Their Functions

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However, managers are quickly learning that their specialized systems don't maintain a life cycle history of the assets, can't determine all the costs associated with the asset, and don't have a measure for return on asset investment. The systems don't provide the relative value of the asset in delivering energy or producing revenue.

To retain the required asset information, managers need an asset data repository that provides a definitive record of all the assets and unifies all the activities and information associated with each asset. Without new tools and new data stores, utility managers are forced to manage assets in virtually the same manner as their predecessors did fifteen or more years ago.

New Capability Required – Asset Repository

The data necessary to determine an asset's life cycle history and ROAI is available from the existing asset systems but the systems are scattered throughout the organization, making manual computations impractical. The asset data needs to be organized by asset and aggregated into an Asset Repository.

The Asset Repository stores the following data for each asset:

- Basic asset data including engineering parameters, location, and distinguishing attributes such as manufacturer and serial number
- Current network configuration (if not available via the other systems)
- All life cycle events for each asset
- Complete cost history from procurement to abandonment including maintenance and configuration changes
- Compliance history (inspection, maintenance, or repair); the Repository may also be the system of record to demonstrate compliance
- Revenue billed and collected prorated to the assets
- Load profiles
- Measures of the financial value of the asset

The Asset Repository will include the analysis tools to present life cycle history (events and costs) and ROAI for potential plans, alternate configurations, and system betterment evaluation.

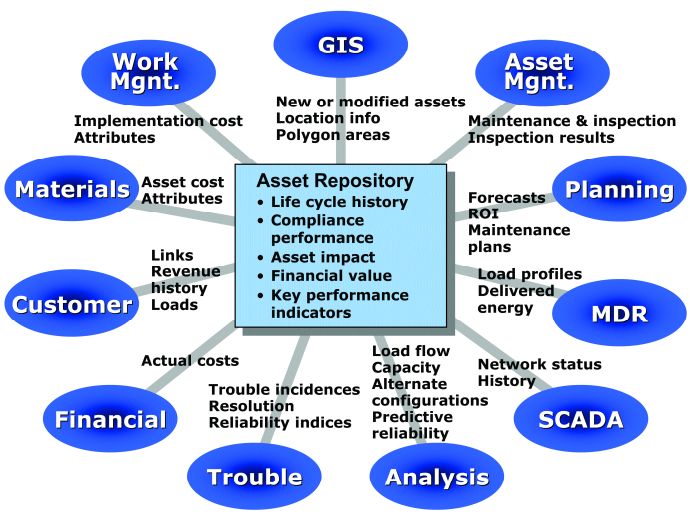

Figure 2: Systems Steward the Data for the Asset Repository

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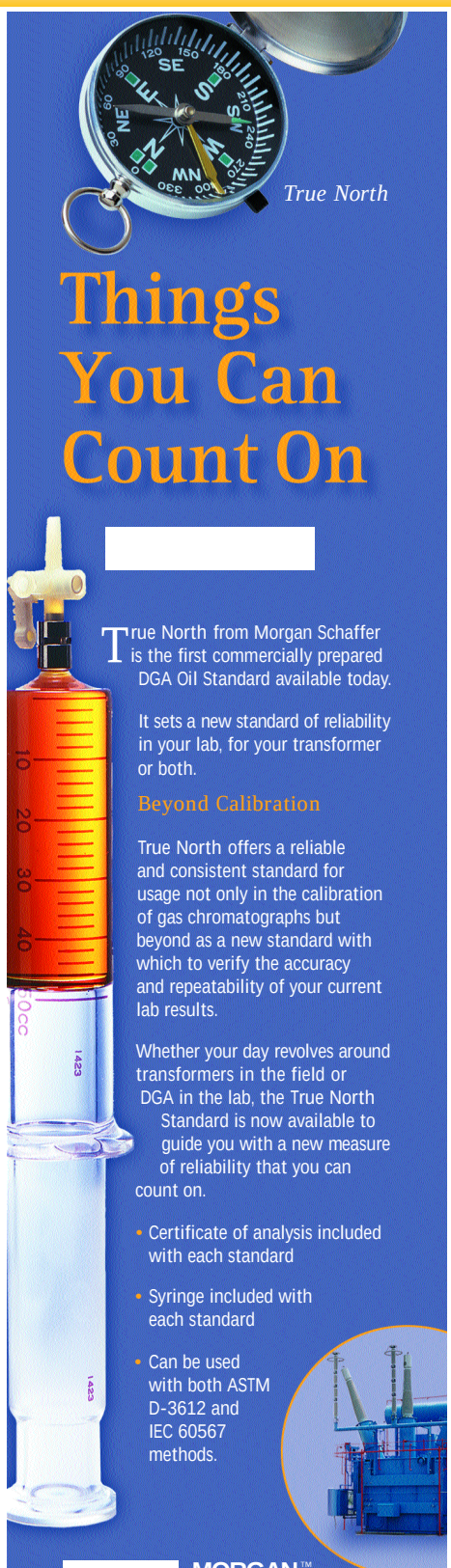

The representative distribution utility system architecture presented in Figure 2 has many different components. These components all capture and maintain data associated with the asset and the work processes. Understandably, the utility doesn't want to add another complicated process, redundant data entry and more system maintenance to implement the Asset Repository.

But in today's system architecture, adding another system doesn't have to mean redundant data entry and increased maintenance effort. Modern integration capabilities with service oriented architectures and Enterprise Application Integration (EAI) capabilities allow systems to "steward" data for other systems without any additional user effort.

An Example of EAI in Action

For example, consider a network expansion job. Assuming the work management and GIS systems have been integrated using a graphical design tool (GDT) capability, the work process proceeds non-redundantly. The GIS and the GDT capture the new assets, modify the connected network, and determine location based data. In the process, the GDT automatically designs the job for the work management system using compatible units. The work management system captures the work process, requisitions material, schedules the work, and stores all labor, equipment, and asset costs. As the work is completed and approved, the GIS posts the version of the work in progress to the as-constructed spatial database.

The work management system, integrated with the financial system, captures all the costs of each process step.

During these work finalization processes, the GIS and work management systems issue messages to the enterprise. Systems like the Asset Repository are waiting to receive and process these messages. The message processing inserts the new assets into the Asset Repository, associates the attributes and connectivity from the GIS, prorates the cost to the assets involved, and starts the maintenance and inspection process. All of this takes place transparently to the user through the automatic generation, transmission, and processing of messages.

As described here, this EAI process is called a "loose coupling" because component systems can be modified, upgraded, or replaced without changing the integration capability. If a new system can create and process the messages in a compatible manner the integration continues to work unchanged.

By focusing on the true cost of assets and unifying their systems and data, utilities can improve their reliability and safety records while reducing maintenance and inspection costs, and increasing the expected life time of their assets.

FMDR

The Facilities Management Data Repository, (FMDR), is a component of LogicaCMG's Asset and Resource Management ARM product suite. FMDR provides an asset repository capability. Implemented in a modern IT architecture, FMDR works cooperatively with existing GIS and work management systems to avoid redundant effort and duplicated process steps. FMDR uses an EAI approach to accumulate information from inspection, maintenance, and compliance systems such as the LogicaCMG Compliance Tracking System.

By analyzing asset life cycle information and by maintaining, designing, and implementing assets guided by return on asset investment or ROAI, utilities can get more from their assets for less investment.

The end result will be a greater capability for the utility to meet shareholder and regulator demands, as well as the service expectations of the utility's customers.

Once a utility has effectively decided what should be done and when it should be done, it needs to consider how, where, and who should do the work. **This is the subject for the second part of this article appearing next month in Electric Energy T&D, March/April issue.** ■

About the Author

Chuck Drinnan is Executive Consultant for LogicaCMG's energy and utilities division located in Houston, Texas. He has over 30 years of experience in asset and resource management for the utility industry. Chuck can be reached at chuck.drinnan@logicacmg.com or call 1-800-334-7101.

LogicaCMG is a global IT solutions company, providing systems integration, consulting, products and services. LogicaCMG's Asset & Resource Management (ARM) product suite includes work management, mobile computing, asset management, compliance tracking, scheduling, and reporting capabilities delivered as a pre-integrated, seamless solution. For additional information visit our web site at www.logicacmg.com/us.

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An Alternative in Complete Meter Data Collection Solutions

Datamatic provides electronic meter reading (EMR) and automatic meter reading (AMR) for hundreds of utilities around the world. Until recently, only one vendor provided a complete solution for manual and automatic meter reading for gas, water and electric commercial, industrial and residential meters. Those days are over. Whether you are an electric, gas, water or mixed services utility Datamatic can provide you the meter data collection tools needed to reduce collection costs, increase accuracy and effectively manage your customer service and system optimization. Datamatic offers this solution as the only vendor of these technologies focused solely on the development and deployment of EMR and AMR solutions.

The right partner, not just the right idea

It starts with an innovative idea, but it certainly doesn't end there. Technology by itself will not take an operation to its next level. A true solution involves the insightful application of technology with solid experience and careful execution. Perhaps a shift is needed: Start viewing your solution as choosing the right technology partner, not just the right technology. A solution's whole is much greater than the sum of its technological parts.

Datamatic has been there since the beginning. By installing the first EMR system 25 years ago, it played a key role in launching the meter reading automation revolution. We've been committed to the industry and partnering with multi-utilities ever since.

Enterprise EMR

The foundation of Datamatic's data collection platform is RouteSTAR MVP, a fourth generation enterprise meter reading application reflecting 25 years of experience, development and customer feedback. MVP's interface is simple, yet powerful, allowing operators to manage multi-utility reading operations across offices or across countries. The scalability of its SQL Server or Oracle databases ensures performance whether it's managing a territory of 300 or 3 million. Rounding out its functional profile are full support for electric, gas and water FIREFLY AMR and TOU/IDR electric meter probing.

A Combined AMR Approach

Automatic meter reading is here to stay, as is the need to make it produce more than just a low-cost monthly reading. Datamatic's FIREFLY® AMR System with ProfilePLUS™ Usage Profiling is a revolutionary fusion of AMR and data-logging technologies producing electric, gas and water usage data previously unavailable without expensive outboard devices or fixed networks. FIREFLY Meter Interface Units deliver fixed network-level interval data at a mobile AMR price point.

C&I Electric

An increasingly competitive market is placing higher demands on C&I electric data collection operations. Utilities and their customers are in constant need of more accurate and timely information to make key energy decisions. Yesterday's "adequate" industry leading C&I system can put you at a competitive disadvantage today; bound to a meter manufacturer, or worse, a fixed set of communication technologies. The CommSTAR MDx C&I Data Collection system has erased the limitations imposed by previous generations of C&I systems. Its open-architectured design allows utilities to take advantage of a wide variety of current wired and wireless communications networks, as well as new comm standards as they emerge.

Meticulous Project Planning and Execution

The right partner brings a sophistication to all phases of an automation project. From initial onsite planning to final QA and system commissioning, seasoned project managers and trainers should not only use their expertise and experience to implement your solution but also to empower customers through efficient "knowledge transfer".

Datamatic takes implementations extremely seriously. We have spent considerable time and resource to ensure all project personnel (including those from the utility and/or installation subcontractors) are the best equipped in the industry. All field installers must complete the demanding Certified FIREFLY Installer™ (CFI) training course and comprehensive examination in order to work on a project. They are taught to use Datamatic-supplied installation, programming, diagnostic tools and techniques that ensure consistency and exceptional system performance.

Managers are trained in the use of our web-based project tracking tool, the FIREFLY ICBM Database. The FIREFLY ICBM provides comprehensive project reporting from any PC connected to the Internet. It ensures that all utility, contractor and Datamatic managers stay "on the same page" as to daily and overall project status. Want to pull a project update at 2am Saturday from the lake house? You shouldn't . . . but you can. The FIREFLY ICBM all but eliminates the cause of most project difficulties, poor and infrequent communications.

Datamatic's longevity and stability through decades of change are a testament to its strength. Long experience coupled with time-tested products allows Datamatic to deliver not only technology, but real-world solutions into today's complex multi-utility environments.

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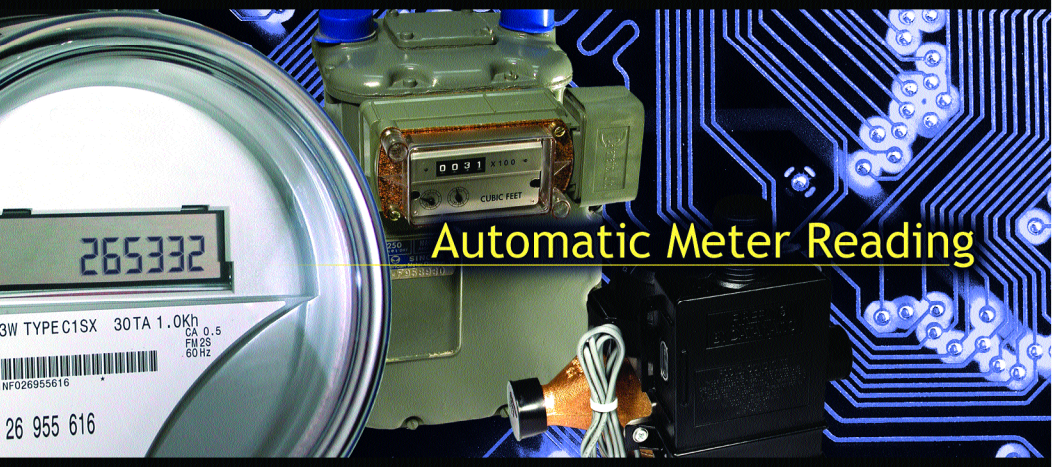
Why Datamatic?



Because utilities have been looking for a meter reading alternative; an integrated solution for residential and C&I data collection.

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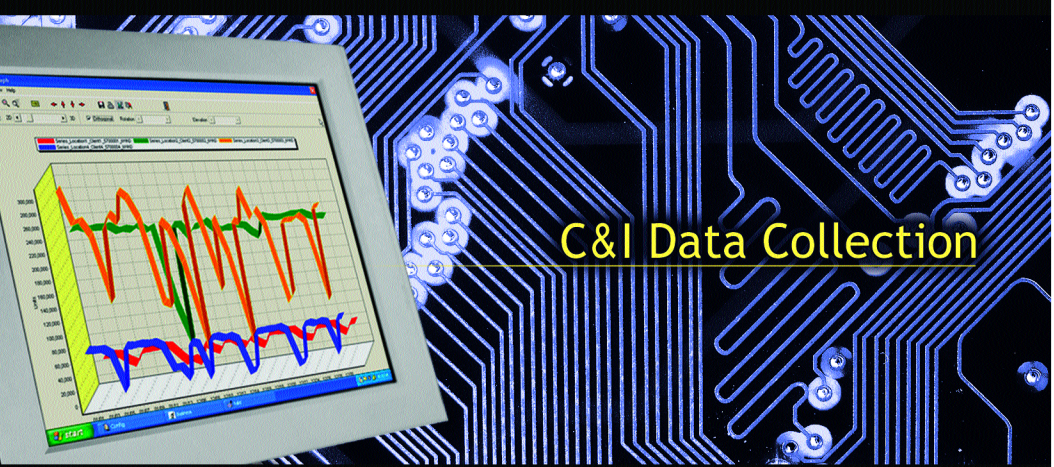

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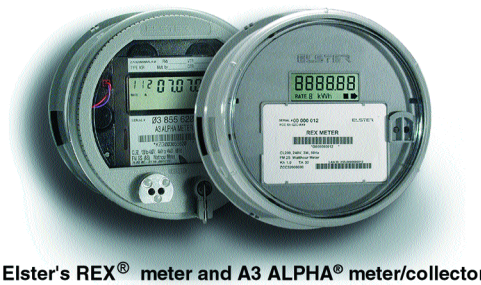
Elster Electricity's EnergyAxis® System with Intelligent Two-Way Communications



Elster's REX® meter and A3 ALPHA® meter/collector

In today's highly competitive global arena, the utility industry faces challenges and opportunities never seen before. Change has become constant, with innovation the standard rather than the exception. Reducing costs, enhancing customer service, and improving operational efficiencies are business strategies common to every company looking to remain competitive and operate profitably.

As a world-class provider of electricity metering products, communication solutions, and metering automation systems, Elster Electricity is a company aggressively pursuing those challenges. According to Ronald B. Via, vice president of sales and marketing, "Our goal is to increase customer revenues through innovative solutions and reduce costs through streamlined operational strategies. The introduction of our EnergyAxis System represents a major advance in network metering communications and extends beyond typical automated meter reading solutions. It reflects our continued commitment to these goals and enables our customers to compete effectively in a changing environment."

The Power of Two-Way Communications

Built on 900 MHz unlicensed radio communications technology, the EnergyAxis System's, fully automated, intelligent two-way communications makes on-request meter reads and server-initiated commands a reality. Its powerful two-way communications, coupled with Elster's electronic single-phase REX® meter, enables utilities not only to read meters, but to change energy, demand, or time-of-use rates as needed, as well as start or stop load profile interval recording, or initiate a service disconnect. To further enhance a utility's customer service capabilities, the system can automatically receive neighborhood power outage or restoration data, local voltage conditions, outage counts and other information.

Engineered for optimum flexibility and functionality, the EnergyAxis System supports targeted deployments of hundreds or thousands of meters, up to full-scale multi-million point installations. Its flexible two-way communications architecture assures greater wireless coverage through the implementation of a "mesh network" in which individual REX meters can function as repeaters. Since each meter can be designated to receive and transmit messages from other meters, the EnergyAxis System works in areas where obstacles exist.

Meter Readings When and Where You Need Them

Locked gates, unleashed pets, or indoor meters all reduce operational efficiencies, drive up metering costs, and reduce revenues. With the EnergyAxis System, these barriers as well as associated problems of estimated bills or rescheduled meter reads are eliminated. High turnover areas, like apartment complexes, universities, and military housing, represent costly service areas, requiring repeated trips to obtain move-in and move-out meter reads, or to provide disconnect and reconnect services. The on-request reading function and the remote operation of Elster's optional disconnect switch improves the utility's ability to connect or disconnect service reducing operational costs and improving customer service.

Rapid Change Requires Intelligent Metering Products

"With the utility industry experiencing unprecedented change, market pressures have made sophisticated pricing methods for electricity a growing necessity. Our system has been built with advanced features that offer utilities optimum metering and billing flexibility for addressing these issues," says Garry January, Elster Electricity's residential meter product manager.

At the heart of the system is Elster's single-phase, residential electronic REX meter with built-in EnergyAxis System communications. Innovative in design and multi-tasking in function, the REX meter provides highly accurate kWh consumption, kW demand, time-of-use metering, critical tier pricing, and load profile interval data, all on command. These features reduce costly site visits and eliminate the need for new metering hardware. Utilities can adjust prices daily, a distinct advantage during peak energy demand periods.

The unique design of the REX meter and the intelligent two-way network architecture enables meter self-registration within the network for true "plug-and-go" capability. This feature eliminates the need for on-site programming, making installation and operation both easy and economical. Once installed, each meter automatically registers with the network. Should local conditions change, meters reregister via alternate paths.

The communications network of the EnergyAxis System utilizes spread spectrum frequency-hopping technology to provide secure, reliable communications between meters and collectors. This technology enables individual meters to be designated as repeaters, creating a dynamic path that optimizes signal strength and maximizes communication distances. Communication distances between meters and collectors are increased, and the number of collectors required is dramatically reduced, improving system economics. The system architecture uses Elster's A3 ALPHA meter as the host for local data collection from the REX meter, making collector installations simple while reducing costs.

For more information on Elster's EnergyAxis System with intelligent two-way communications, contact us today!

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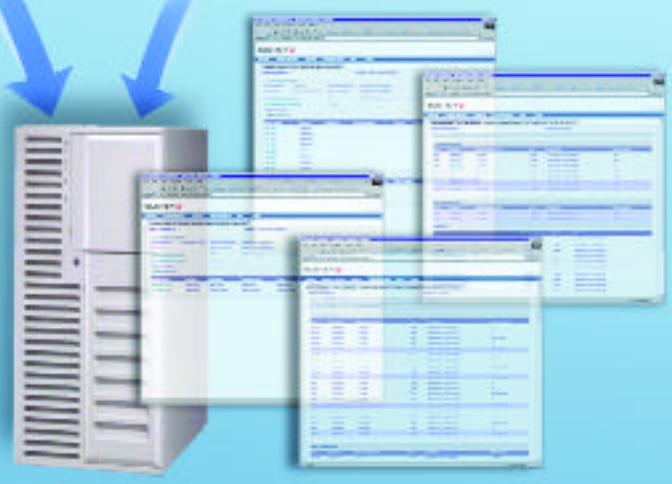

Metering Automation Server

- Two-way communications to all meters
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Get Better Results.

When a storm hits and the power goes out, your customers depend on you to restore it as quickly as possible. Don't leave them in the dark. Make sure you can rely on your AMR system to provide system-wide outage detection.

Better Utility Management Begins with Hunt

This is just one example of how Hunt Technologies' advanced AMR solution provides the information you need to better manage your utility. Hunt's Turtle® System allows you to see every endpoint at once without polling. So, when life's little emergencies pop up, you'll have the information you need to diagnose trouble spots and restore power quickly.

Hunt's Turtle System is fundamentally different from any other AMR system on the market. It delivers constant communication with every endpoint in your distribution network and logs a wealth of data options for retrieval. By seeing the whole system, your utility will see better results.

Hunt provides powerful capabilities to utilities every day:

- Water, gas and electric AMR
- Outage detection and restoration notification without polling
- Dynamic pricing capabilities for better revenue and power management
- Remote system management with .NET® technology
- Compatible with multiple meter manufacturers

Water, Gas and Electric AMR

Find the right mix for your utility's diverse needs. Hunt Technologies delivers the only power line carrier (PLC) solution for electric, water and gas meters. Gain the flexibility to blend AMR technologies to meet your specific operational and financial objectives.

Outage Detection and Restoration Notification without Polling

Get automatic, real-time outage detection and restoration notification without polling your endpoints. Determine the location of each outage and greatly improve the accuracy of your outage management. Your crews will know the job is done before moving to a new location.

Dynamic Pricing Capabilities for Better Revenue and Power Management

Analyze collected data and establish a varied billing rate program that aligns with customer usage patterns. Use dynamic pricing options to help your customers save.

Remote System Management with .NET® Technology

Retrieve information from any location with Web access – in the field or in the office.

No need to rely on a master station to see your system.

Compatible with Multiple Meter Manufacturers

Experience flexible solutions designed to fit your needs, no matter which meters you use. Hunt products are compatible with all major meter manufacturers, including the newest solid-state models.

The Total AMR Solution

Hunt Technologies provides utilities with a full range of system capabilities – from cost-effective monthly reads, to daily reads with outage information, to a system with advanced features for electric, water and gas. Find a solution that is right for you.

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Amazing Results

It's amazing what you can do when you have choices.

Our advanced AMR solution lets you choose the meter you want, use the equipment and components you desire, and capture the information you need for effective customer management. Put the Turtle to work. You'll be amazed by the results.
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AMRON's Myth Busters

By: Mark Leach, Chief Technology Officer, AMRON Technologies, Inc.

Myths thrive in our industry. It's unfortunate, but myths tend to proliferate faster than cold, hard truths. I hear so many myths I can't keep them all straight. Of the hundreds swirling around, let me bust two of my favorites:

MYTH #112: Advanced metering is the same as automatic meter reading

MYTH #358: "Real time" is an absolute term in advanced metering

MYTH #112

First, if AMR is the promised land, then why in the heck isn't every utility relying on it and preparing to deploy it?

It's because AMR has more holes than the Titanic's hull. All sorts of holes. AMR is more like a wasteland than promised land.

AMR's hype outpaced reality, leaving the marketplace littered with failures. Here's why:

- AMR was viewed as a niche technology with niche benefits rather than as an enabling platform touching every area within a utility.
- Deregulation turned ROI analyses into a fool's game. Outrageously long payback on AMR investments made the risk too high.
- Hardware designs were clunky, and totally underglass designs a pipedream.
- Network coverage, communication costs, and quality issues added layers of complexity, sucking efficiencies.
- Data overload was suffocating and software analysis was complicated, so metered data piled up with no means of understanding what any of it meant.

For AMR to prosper, it must morph into something more significant: Advanced metering.

> Advanced metering is, at its core, a complete system that incorporates and integrates underglass hardware, flexible communications via public or private networks, and software for web-based analysis and sophisticated management

Advanced metering can address AMR's deficiencies. Here are some of its chief benefits:

- The billing department gets a whole lot more efficient in collecting usage data and issuing customer invoices.
- The call center receives far fewer calls (80% of calls are bill related in some fashion) because bills are more accurate.
- Risk management faces less risk with time of use metering.
- Real-time pricing makes sales executives more competitive in retaining or attracting new customers.
- Load management and load aggregation provides a load of new micro and macro efficiencies.
- Marketing adores advanced metering's energy use diagnostics because it changes the selling equation from commodity/cost to one of partner/value.
- Operations and field support enjoy insights into electric power issues such as transients, voltage disturbances, power factors, and harmonics.

A final word or two on this myth…

AMR is yesterday's advanced metering. The former is a hodgepodge of ill-suited, ill-fitting solutions that rarely operate as promised. Advanced metering — performed correctly — offers many more benefits that touch the entire enterprise.

MYTH #358

What the heck does the phrase "real time" mean in the world of business? Everyone talks about business moving in "real time." Real time this. Real time that. It's assumed everyone intuitively understands what "real time" is.

But, in fact, "real time" means different things to different people. To some it means "close to now." To others: "when we can make it happen."

"Real time" has morphed into a relative term, not an absolute one.

I'm no Websters, but to me "real time" should mean real, "real time." Real,"real time" should mean now, not later. Not over a period of many minutes or hours or days or weeks.

AMRON uses the phrase real, "real time" to describe how a connected meter can be read through our M5 advanced metering platform. In real, "real time," our M5 platform initiates a wireless connection to the meter, captures data located anywhere in the ANSI tables, relays the data to our data center, and updates our Advanced Metering Portal. All of this is completed in six to seven seconds. Not once a night in batches. In real, "real time."

Utilities face a number of business challenges that demand an increase in the velocity of their operations. Check under the hood and you'll discover that "real time" is in the eye of the marketer, and real, "real time" is what you want.

A final word or two on this myth…

If you're seeking to move to "real time" operations, consider the real, "real time" M5 advanced metering platform.

About the author –

Mark Leach is the Chief Technology Officer of AMRON Technologies, Inc. and a highly regarded expert on AMR and advanced metering. He can be reached at mleach@amronm5.com.

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WITH "SMART" AUTOMATED METER READING TECHNOLOGIES, IT USUALLY TAKES MORE THAN THREE YEARS TO SEE ANY ROI.

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WAMS: Monitoring, Protection and Beyond

By: Lawrence Broski, Sethuraman Ganesan and Dr. Daniel Karlsson, ABB Inc.

Transmission systems around the world are being squeezed between two great forces. On one side, increasing demand, energy trading and economic pressures are pushing transmission owners and grid operators to maximize the use of transmission assets. On the other, reliability concerns—especially since 2003's spate of major disruptions—are forcing these same players to be more vigilant about just how far they push the grid's infrastructure.

At the most basic level, this situation presents a choice between two courses of action: build more lines, or do more with existing ones. Clearly, there are places today where the only viable solution is to add transmission capacity. However, given the cost, time and siting issues associated with such projects, it's not surprising that utilities now are focusing more than ever on getting more out of their existing systems.

Recent advances in measurement, communications and analytic technologies have produced a range of new options. In particular, wide area measurement systems (WAMS) have come to the fore as a means to address not just immediate reliability concerns but also operations issues and long-term system planning as well.

Phasor Measurement – the Key to WAMS

Critical nodes in today's transmission grids are usually monitored using static or quasi-dynamic data based on RMS measurements. Traditional SCADA/EMS systems, however, can provide only a limited picture of dynamic grid conditions. Indeed, these systems can take a minute to deliver a snapshot of a system whose characteristics are changing at the speed of light.

In contrast to conventional control systems, where RTUs are used for acquisition of RMS values of currents and voltages, a Wide Area Monitoring System acquires current, voltage and frequency phasor measurements collected by Phasor Measurement Units (PMUs), from selected locations in the power system. The measured quantities include both magnitudes and phase angles, and are time-synchronized via Global Positioning System (GPS) receivers down to a time resolution of one microsecond.

The availability of highly accurate synchronized phasor measurements has enabled a new level of monitoring capability. By comparing local phasor measurements, operators can observe not only the steady-state, but also the dynamic state of critical nodes in their transmission and subtransmission networks. This improvement facilitates better, faster analyses of grid conditions, which in turn provide operators with more time and more options to preserve system stability. It also represents a quantum leap in the quality of data on which transmission planning and everyday operational decisions are based.

Defining Power System Phenomena

Utility needs and problems are often formulated in very loose terms, such as "intelligent load shedding", "protecting the system against major disturbances", and "counteracting cascaded line tripping". In order to address these needs, they have to be broken down to physical phenomena that can be mitigated by a management scheme making use of information from WAMS. Some examples include:

- Transient angle instability
- Small signal angle instability
- Frequency instability
- Short-term voltage instability
- Long-term voltage instability
- Cascading outages

To address each of these phenomena, a reliable (based on redundancy and robustness) system has to be designed with respect to input variables, decision criteria and output actions. Parallel systems counteracting different phenomena, and different layers of safety nets, can also be designed and coordinated. PMUs allow for direct and fast angle measurement, instead of indirect power measurement, and enable the development of more accurate control algorithms for emergency control or protective actions.

Architecture Options

The impact of WAMS on protection schemes and short-term reliability is obvious. So, how can utilities take advantage of these advances? The answer, to be sure, will depend on the unique needs of a given organization.

Enhancements to SCADA/EMS

At one end of the spectrum, enhancements to the existing EMS/SCADA can be made. However, the possibilities of extending the SCADA/EMS system with new functions tend to be limited. Therefore it might be relevant to provide new SCADA/EMS functions as "stand alone" solutions (e.g., load shedding) more or less independent of the ordinary SCADA/EMS system.

"Flat Architecture" with System Protection Terminals

Protection devices or terminals are traditionally used in protecting equipment (lines, transformers, etc.). Modern protection devices have sufficient computing and communications capabilities that they are capable of performing beyond the traditional functions. When connected together via communications links, these devices can process intelligent algorithms based on data collected locally or by other devices via data sharing.

In a "flat architecture," de-centralized, specially developed interconnected system protection terminals are installed in substations, where actions are to be made or measurements taken. Actions are preferably local (i.e., transfer trips should be avoided) to increase security. Relevant power system variable data is transferred through the communication system that ties the terminals together. Different schemes—against voltage instability and frequency instability, for example—can be implemented in the same hardware.

Multilayered Architecture

While the above two designs attempt to extend the "reach" of existing control domains (protection terminal being one domain, and EMS being the other), there is no guarantee that the end solution will address all the operator's needs. A multilayered architecture provides a more comprehensive alternative.

There are up to three layers in this architecture. The bottom layer is made up of PMUs or PMUs with additional protection functionality. The next layer up consists of several Local Protection Centers (LPCs), each of which interfaces directly with a number of PMUs. The LPCs act as mass storage for PMU readings that are accessible from the top layer, the System Protection Center (SPC). With this approach, the local protection center forms a system protection scheme while the interconnected coordinated system forms a more comprehensive defense for the network as a whole.

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More Than Just Protection

WAMS is most frequently associated with protection, but in truth it is more fundamental than that. WAMS is an enabling technology, and while its contribution to preserving grid integrity in an emergency is clear, it represents an equally important advance for the analytic and planning activities that will preserve grid integrity over the long term.

Phasor measurements can be utilized offline, for example, as input for calibration and verification of the dynamic models of various transmission system components. More accurate models mean better planning, and that ultimately results in a more efficient, more resilient grid.

WAMS can have a significant impact on day-to-day operations as well. Having a more precise understanding of the conditions at a specific intertie, for example, would allow an operator to push that connection closer to its operating limits without sacrificing reliability. This is precisely what ETrans, the Swiss grid operator, sought to do with its first WAMS installation.

The company wanted to more closely monitor large power transfers across its North-South corridor. They placed four PMUs at strategic locations at both ends of the lines, and found that the difference in voltage phase angles across the system proved to be a very good indication of system stress caused by power export to the south. There is, in fact, an almost linear relationship between the transferred power and the voltage phase angle difference. Additionally, line losses and impedance can be computed very accurately, which in turn provide the means to derive average line temperature. Armed with this information, ETrans can more confidently push the limits of the transmission assets by, for example, increasing the load on a given line when ambient temperatures and wind allow.

One Size Doesn't Necessarily Fit All

The potential to improve power system performance and reliability using smart controls instead of more high voltage equipment appears to be great. The advantages of phasor measurement, and of WAMS in general, extend well beyond the more publicized short-term reliability applications. However, implementing these technologies should be undertaken with a focus on the specific needs of the given utility. Some organizations may wish to introduce a complete system in order to address a large number of issues at once, while others may want to proceed more slowly with small installations in parallel with present systems. WAMS is still new in terms of commercial application, and while such systems are likely to become common, for now their benefits will be best realized one step at a time. ■

Bios...

Lawrence Broski works in sales in ABB's Network Management business unit in Edmonton, Alberta.

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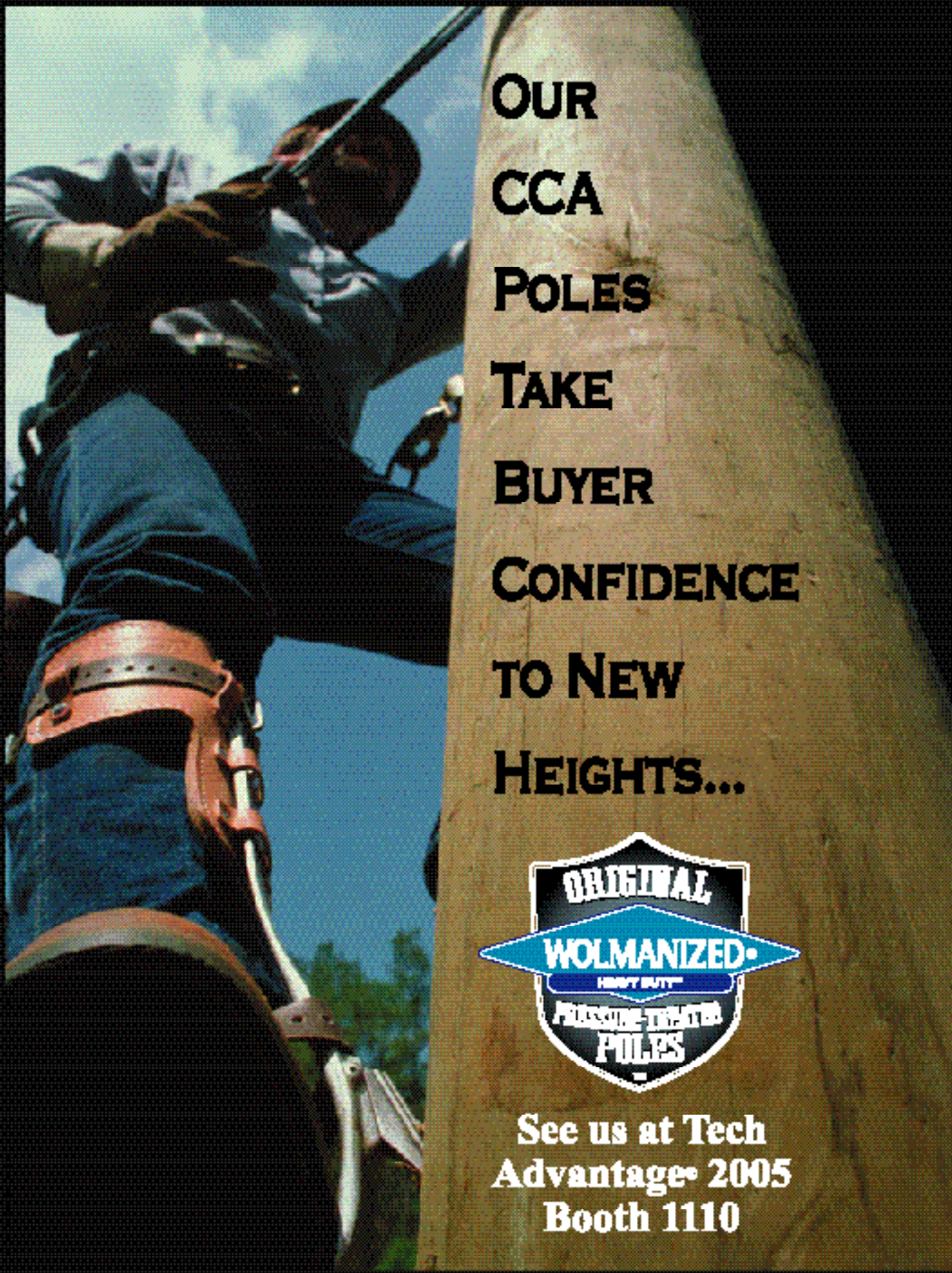

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Note: The TechAdvantage Conference will be held at the Sheraton San Diego Hotel & Marina; TechAdvantage Expo and Technology Showcase will be held at the San Diego Convention Center

Wednesday, February 23, 2005 -- Preconference Workshops

(All workshops 8:00 a.m. – 5:00 p.m. unless otherwise noted)

A – System Analysis and Overcurrent Protection
B – Managing Physical & Cyber Security
C – MultiSpeak Integrated Training (8:00 a.m. – Noon)
MultiSpeak Users Group Meeting (2:00 – 5:00 p.m.)
D – Wind Interconnection Workshop
E – IT Project Management Across Departmental Lines
F – Certified Purchasing Manager (Modules 1, 2)
G – Materials Management Certificate Program (Unit I)
H – Solar Turbines Plant Tour (1:30 – 4:00 p.m.)

Thursday, February 24, 2005 -- Conference Program

8:30 – 10:15 a.m.
– General Session

EO / IT / SM Morning Schedule:

10:30 - 11:45
Breakout Sessions
- EO 1A – Finding/Mitigating Power Quality Sources
- EO 1B/IT 1B –RUS Emergency Restoration Plan (EO/IT Joint Session)
- EO 1C – Equipotential Grounding
- EO 1D – Transmission Upgrades
- IT 1A – Patch Management: Approaches and Strategies
- IT 1C – Co-op Communications Now Routed Through the Stars
- SM 1A –The Value of Education in Supply Chain Management

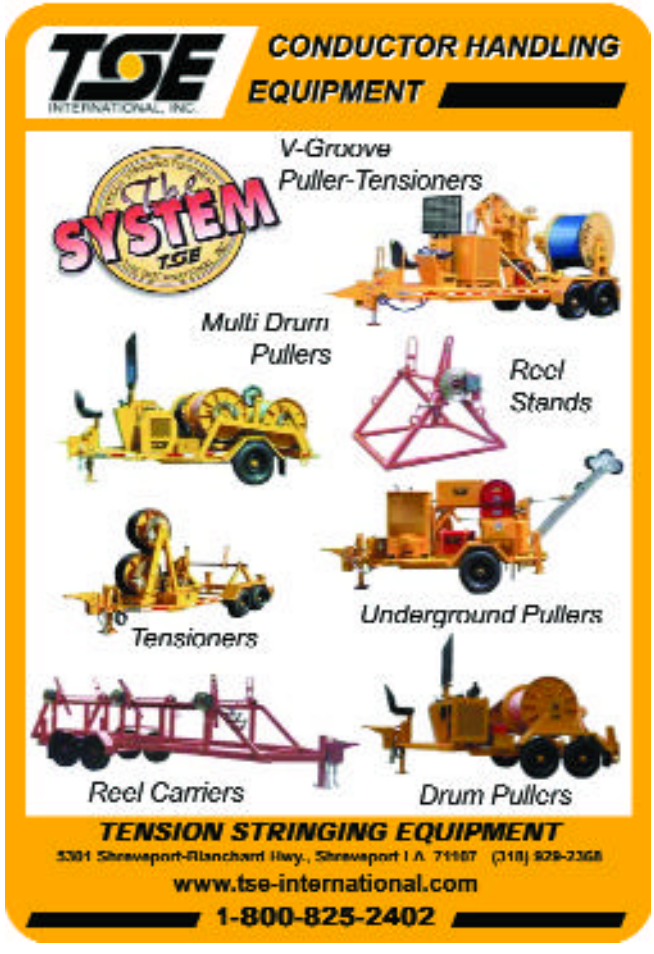
11:45 a.m. – 1:15 p.m. Lunch

EO / IT / SM Afternoon Schedule:

1:15 - 2:30 p.m.
Breakout Sessions
- EO 2A – System Grounding Techniques
- EO 2B – Exploring Automated Field Staking
- EO 2C – Distributed Generation: Where Are We?
- EO 2D – Metering Advancements and Applications
- IT 2A – Designing an Effective End-User Training Program
- IT 2B – Critical Infrastructure Protection (Panel Discussion)
- IT 2C/SM 2C – Win a Positive ROI with Document Imaging and Scanning- - - (IT/SM Joint Session)
- SM 2A – Warehousing FUNdamentals
- SM 2B – Cultivating the Vendor/Supply Chain Relationship
- SM 2D – ABC Inventory

Thursday, February 24, 2005 (continued)

2:45 - 4:00 p.m.
Breakout Sessions
- EO 3A – NESC 2007 Code Proposals and YOU
- EO 3B – Joint Use Pole Attachments
- EO 3C – Substation Maintenance Practices
- EO 3D – Equipotential Grounding
- IT 3A – Enterprise Content Management: Creating a Document Strategy
- IT 3B – Peer-to-Peer Forum: Less than 50K Members
- IT 3C – Peer-to-Peer Forum: Greater than 50K Members
- SM 3A – Peer-to-Peer Forum: Less than 20K Members
- SM 3B – Peer-to-Peer Forum: 20 - 40K Members
- SM 3C – Peer-to-Peer Forum: 40K + Members
- SM 3D –Peer-to-Peer Forum: G&T Issues



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NRECA's TECHADVANTAGE® 2005 CONFERENCE & EXPO

As of January 4, 2005

Friday, February 25, 2005

EO / IT/SM Morning Schedule:

8:45 - 10:00 a.m.

Breakout Sessions

- EO 4A – Power Quality: Benchmarking and Reporting
- EO 4B – Automation Communication Alternatives
- EO 4C – Right-of-Way and Vegetation Management
- EO 4D – Broadband Over Power Lines – How Does It Work?
- IT 4A – GIS Systems
- IT 4B – Balancing Security & Remote Access
- IT 4C – Performing a Cyber Vulnerability & Risk Assessment
- IT 4D – Can You Hear Me Now? Expanding Data Applications to Cell Phones

SM 4 A – Barcoding -- How It Really Works

SM 4B – Running with the Big Dogs – Making Supply Chain a Strategic Player

SM 4 C – Communication Barriers, Breakdowns and Bottlenecks

10:15 - 11:45 a.m.

Breakout Sessions

- EO 5A – Blinks – Fact & Fiction
- EO 5B/IT 5B – Strategic Tech: Supporting the Co-op's Goals and Mission
- (EO/IT Joint Session)
- EO 5C –Using Field Computers to Enhance Operations
- EO 5D – ROW Acquisitions: Legal Implications
- EO 5E – Transmission Design Additions – Fiber Optics and Others
- IT 5A – Balancing the Need for Employee and Critical Infrastructure Security
- IT 5C – A Practical Approach to Cyber Security Policy and Practices
- IT 5D – Storage Area Network Implementation
- SM 5A – Supply Chain Core Skills
- SM 5B – Fleet Questions You Can't Outrun
- SM 5C – Tailoring Contracts to Meet Inflationary Pressures

11:45 a.m. – 1:15 p.m.

– Barrier Busters Networking Luncheon

Advance registration required Conference attendees only, no guests. Limit 375.

Friday, February 25, 2005 (continued)

EO / IT / SM Afternoon Schedule:

1:15 - 2:30 p.m.

Breakout Sessions

- EO 6A –Accounting for Non-Accountants
- EO 6B/IT 6B – Strategic Tech: Supporting the Co-op's Goals and Mission, Part II - (EO/IT Joint)
- EO 6C – Being Dollar Smart About Field Data
- EO 6D – Field Computing: The People Perspective
- IT 6A – Preparing for the Worst
- IT 6C – Structural Analysis in the Next Generation GIS
- SM 6A – Adding Strength to the Supply Chain
- SM 6B – Contracts for Each Supply Chain Link
- SM 6C – Cost-Saving Techniques

2:45 – 4:00 p.m.

Breakout Sessions

- EO 7A – Peer-to-Peer Forum: AMR
- EO 7B – Peer-to-Peer Forum: Line Extension, CIAC
- EO 7C – Peer-to-Peer Forum: Pole Attachments
- EO 7D – Peer-to-Peer Forum: G&T Issues
- EO 7E – Peer-to-Peer Forum: Reliability - Power Quality
- IT 7A –Requirements Gathering: Today and Tomorrow's Co-op Needs
- IT 7B – Critical Infrastructure Protection – Ask the Experts!
- IT 7C – Securing Your MS Internet Information Server
- SM 7A – Document Management for Supply Chain Personnel and Auditors
- SM 7B – Cultivating the Vendor/Supply Chain Relationship
- SM 7C – Communication Barriers, Breakdowns and Bottlenecks

4:30 – 7:30 p.m.

TechAdvantage® Expo Opens

- Gala Grand Opening Celebration

Saturday, February 26, 2005

9:00 a.m. – 2:30 p.m.

Technology Showcase

10:30 a.m. – 3:00 p.m.

TechAdvantage Expo Open

10:30 a.m. – Noon –

Special expo session for co-op managers and staff ONLY. This is your opportunity for exclusive conversation and networking with exhibitors.

Sunday, February 27, 2005

11:00 a.m. – 3:00 p.m.

TechAdvantage® Expo Open

Monday, February 28, 2005

11:30 a.m. – 2:30 p.m.

TechAdvantage® Expo Open

NOTE: TechAdvantage Expo and Technology Showcase will be held at the San Diego Convention approximately 2.5 miles from the Sheraton San Diego Hotel. Shuttle transportation will be provided beginning Friday afternoon at 4:00 p.m. and continue through Monday afternoon. ■

TechAdvantage 2005 Expo Exhibiting Companies

Company	Booth
2005 IEEE PES T and D Expo	1427
4-G Equipment	425
4DataLink	1625
ABB Inc.	212
ACcess Broadband	1807
ACES Power Marketing	1306
Advanced AMR Technologies	903
Advanced Control Systems	301
Advanced Utility Systems Corporation	334
Altec Industries,Inc.	1606
Alvarion Inc.	200
American Iron and Steel Institute	1629
American Safety Utility Corporation	1806
American Wind Energy Association (AWEA)	109
Apogee Interactive, Inc.	521
Arch Wood Protection	1110
Arista Information Systems	1817
Arkansas Electric Cooperatives,Inc.	1207
Asplundh Tree Expert Company	924
ATS,Inc.	512
Audio Visual Innovations	1814
Avistar Inc.	533
Baron USA,Inc.	225
Basin Electric Power Cooperative	235
Beech Street	830
Bermex,Inc.	1209
Beta Engineering	1030
BHP Energy Solutions,Ltd.	213
BLP/Dialight Corp.	1912
Bombardier Utility Vehicles	1626
Bridges Electric, Inc.	1231
Buckingham Mfg Co. Inc.	435
Business Information Systems	106
C.H.Guernsey & Company	701
C3--Ilex	1729
Calpine Corp.	424
Cannon Technologies Inc.	1024
Caremark Inc.	931
Carhartt	1810
Carina Technology	732
Cass County Electric Cooperative	1312
Catbird Networks	928
Caterpillar Inc.	1300
Cayenta,Inc.	1431
CCN	832
Centurion,Inc.	1835
CEVA Energy	1624
Chapel Mapping	1706
CIS Conference, Inc.	1101
CMC/ESP Utility Products	1834
Cogsdale Corporation	100
Colorado Energy Management LLC	535
Comsquared Systems	1233
Comverge, Inc.	932
Conduit Repair Systems,Inc.	327
Continental Utility Solutions Inc	324
Convectair	418
Cooper Power Systems	400
Cooperative Response Center (CRC)	1100
Currin Energy Page, LLC	1130
CYME International T&D Inc.	1921
Daffron & Associates,Inc.	900
Datamatic, Ltd.	300
DATAMATX	1229
dataVoice International,Inc.	1714
Davey Resource Group	609
Deloitte	1225
Delta Star	1725
Doble Engineering Company	1324
Document Imaging Solutions,Inc.	1425
DuPont Vegetation Management	506
E. O. Schweitzer Manufacturing Co.	500
eBid Systems	308
ECI	119
ECO Technology Solutions,LLC	616
Eco-Electrical Systems,Inc.	227
Electracash	111
Electric Energy Publications	**224**
Energy Alternatives	1710
Energy Consulting Group	531
EnerVision,Inc.	1000
Enspiria Solutions,Inc. - an Osmose Company	910
Environmental Protection Services	113
Envision Utility Software Corporation	1200
Equipment Technology, Inc.	1600
ERMCO	1106
ESRI	1424
EUDA-GRESCO Utility Supply, Inc.	703
Eye Lighting International of North America	501
FLIR Systems	105
FPL Energy	1901
Franklin Equipment Company	415
G&W Electric Company	502
GDS Associates,Inc	333
GDX,Inc.	1330
GE Energy	518
Genics,Inc.	409
Geotek,Inc.,PUPI Division	312
Global Power Supply	134
Graphic Technologies,Inc.	1924
Great Southwestern Construction	209
GridNet Broadband	1718
HDW Electronics	1727
Health Dialog	933
Henkels & McCoy, Inc.	1334
High Cotton	412
Hill Manufacturing Inc.	1832
Houston Wire and Cable Company	102
Howard Industries,Inc.	218
Hubbell Power Systems	1724
Hughes Brothers,Inc.	320
Hunt Power/MeterSmart	433
Hunt Technologies,Inc.	806
Huskie Tools	325
IBEC	1228
IBM	1818
ICUEE	1819
IFD Corporation	1415
Immediate Response Spill Technologies	519
Infrared Solutions	331
Innovative Utility Products	1528
Itron	1632
JCMB Technology Inc.	1303
Joslyn Hi-Voltage	1401
Kaddas Enterprises,Inc.	926

TechAdvantage 2005 Expo Exhibiting Companies

NRECA's TECH ADVANTAGE® 2005 CONFERENCE & EXPO

As of January 10, 2005

TechAdvantage 2005 Expo Exhibiting Companies

Company	Booth
Katolight Corporation	1900
Kershaw Manufacturing	201
Kiefer Industrial Trailers	607
LabOne Inc.	935
Landis+Gyr	825
Laser Technology, Inc.	112
Marathon Water Heaters	600
MasTec, Inc.	1027
Mauell Corporation	1132
McFarland Cascade	1815
Megger	307
Metabridge LLC	1211
Milsoft Utility Solutions,Inc.	1406
Milspec	206
Mincom	114
Miner & Miner	1732
MiniMax	524
Moloney Electric Inc.	809
MultiPlan,Inc.	834
MultiSpeak - NRECA	1103
NASCO Industries,Inc.	1915
National Country Market	1131
National Rural Electric Cooperative Association - NRECA	1116
NISC	915
North American Wood Pole Council c/o WWPI	419
North Pacific Group	406
Northrop Grumman IT	306
NRTC	1400
Nynas USA Inc.	107
Okonite Company, The	1025
OneSwitch	332
ONLINE Utility Exchange	330
Origin GeoSystems,Inc.	1432
Osmose Utilities Services,Inc.	1012
Osmose Wood Preserving	230
Panasonic Computer Solutions Company	710
Partner Software	1935
Patterson & Dewar Engineers,Inc.	811
Pike Electric, Inc.	831
Pirelli Power Cables & Systems	730
Plant Growth Management Systems	215
Power Delivery Associates,Inc.	1530
Power Monitors,Inc.	1906
Power Quality Systems	1007
Powerlineman	326
Precise Power Corporation	1800
Preformed Line Products	634
Proactive Systems,Inc.	1933
ProCore Solutions	1820
Professional Computer Systems	1700
QBOS	1922
QEI,Inc.	1032
Radius Technology Corporation	1135
Rainbow Treecare Scientific Advancements	800
Rauckman Utility Products,LLC	1907
Renfroe Collection of Fine Art,The	431
Ripley Company	835
RS Technologies	108
S&C Electric Company	1720
Schweitzer Engineering Laboratories,Inc.	601
SecurePipe	125
SecureWorks	1301
SensorLink Corporation	503
Sensus Metering Systems	414
Service Concepts	1124
Service Concepts	1224
Sherman & Reilly Inc.	1825
Siemens PT&D	606
Solar Turbines	724
Solidification Products Int'l Inc.	226
Solomon Corporation	802
South Kentucky Technical Services	232
Southeastern Data Cooperative, Inc.	1206
Southeastern Reprographics,Inc. (SRI)	1524
Staples Business Advantage	427
Statewide Editors Association	1532
Steffes Corporation	1018
Stratos VSAT, Inc.	901
Sumter Utilities,Inc.	1911
Survalent Technology Corporation	407
Swett & Crawford - Electric Utilities Division	1006
T&R Service Company	314
Tadpole-Cartetsia	1928
Tantalus Systems Corp.	624
TEK ID Inc.	1811
Televox Software	203
Terex Utilities	1616
Therma-Ray Incorporated	1908
Thomas & Betts Corporation/Elastimold	1234
Time Manufacturing Company	1824
Touchstone Energy	1318
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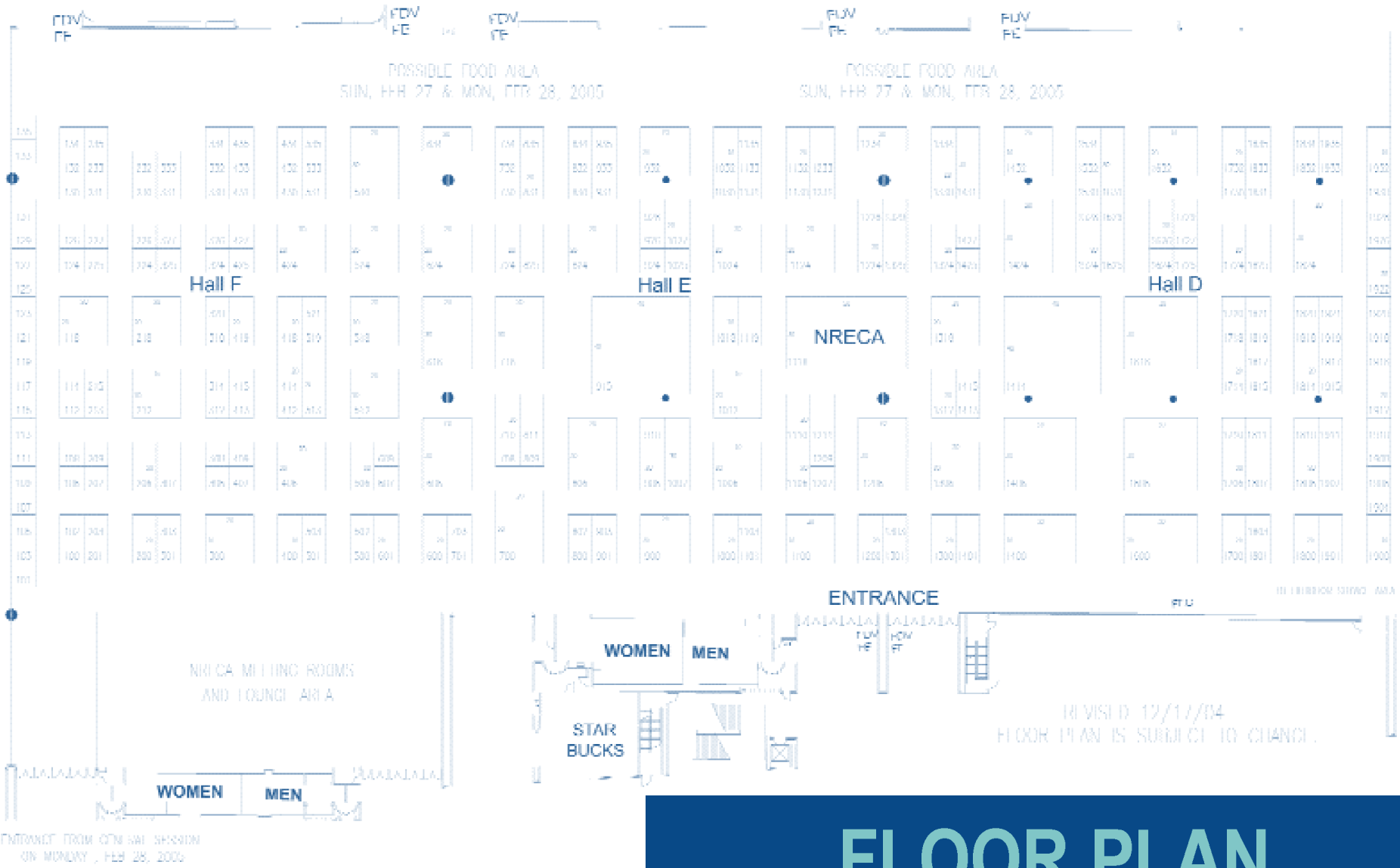

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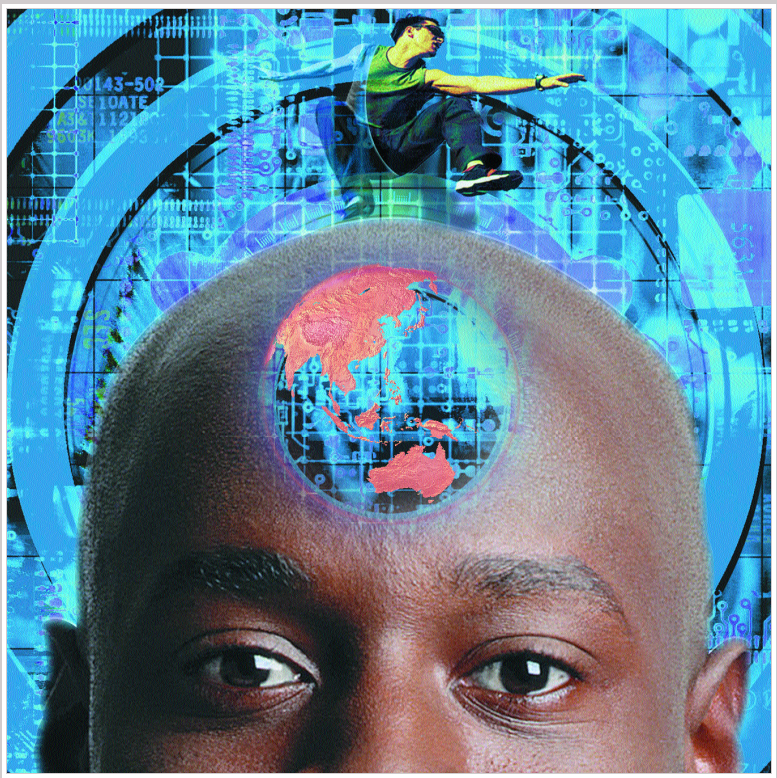

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CEATI - MANAGING ELECTRICAL POWER QUALITY CHALLENGES

By: Mr. Jerry Lepka,Technology Coordinator of CEA Technologies' Power Quality Interest Group.

The existence of modern society and its efficient functioning are more than anything else dependent on one single product - electricity. All electricity users - industry, commercial organizations, telecommunications, hospitals, educational institutions, and millions of private citizens - fully expect that electric power will always be available at a simple flick of a switch, in whatever quantity is required, and with the all the quality attributes that are required for safe, efficient and continuous operation of the devices it powers. In our society, electricity is a product where availability and quality is taken for granted. Yet in contrast to other products, electricity cannot be effectively stockpiled and carefully inspected for quality before it is delivered. Electrical supply must continuously match load demand every second of the day, each and every day, month and year, making it difficult to control and maintain power quality. Slight disturbances such as momentary voltage sags and spikes, power harmonics and voltage unbalances are intrinsic characteristics of electricity that directly impact the efficiency and performance of the electric equipment. Very often these problems will go undetected until after more serious disturbances occur interrupting the manufacturing process, damaging equipment or spoiling products. Unless the sources of these power quality disturbances are quickly identified and the underlying causes diagnosed and corrected, the cost to the user can be very high. As electricity permeates virtually every aspect of contemporary society, poor power quality will affect a large number of users. A number of studies have estimated the annual cost of power quality problems to the American economy at 12 billion dollars annually.

Determining the sources of poor power quality can prove to be a complex task. There are hundreds of possible factors. Some disturbances may originate within the electricity supply network while others may be located within the users' systems. In addition, many of the sources of power quality disturbances are interactive, making it difficult to accurately trace them and to diagnose the root cause of the problem.

Power quality also involves a large number of stakeholders, from electrical utilities, electrical equipment manufacturers and suppliers, regulators, consultants, educational institutions, right to the multitude of electricity users. To properly resolve power quality issues, it is important that the stakeholders not only have a common understanding of those issues, but also work in coordinated and cooperative ways to find solutions.

To remain competitive in today's global market, developed nations must expand the "knowledge economy" which is based on skills, cutting-edge technologies and high productivity. Such efforts cannot be achieved without an affordable, reliable and high quality electrical power base. It has long been recognized that power quality will continue to play an increasingly important role in defining the competitive capability of national economies and infrastructure systems. The increasing role of power quality will be further accelerated by the proliferation of non-linear loads - such as switched power supplies which are found in most of today's electronic equipment. Also to be considered is an increasing penetration of small distributed generators with electronic interfaces between the device and the power system, such as photovoltaic cells, fuel cells, wind turbine generators, etc. Additionally, the commercial aspects of open electricity markets are increasingly stretching power systems' operation closer to their technical limits and narrowing the operational safety margins needed to cope with larger power quality disturbances. Real or perceived decrease of power quality levels will also influence public opinion and, indirectly, government regulators who in turn will develop and assert the policy framework in which the electricity industry will be regulated.

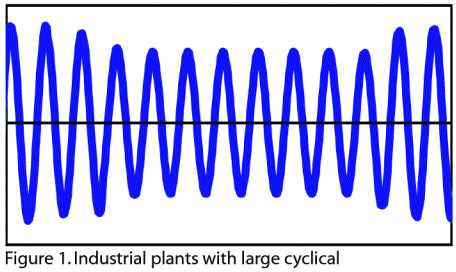

Figure 1. Industrial plants with large cyclical loads often cause voltage sags.

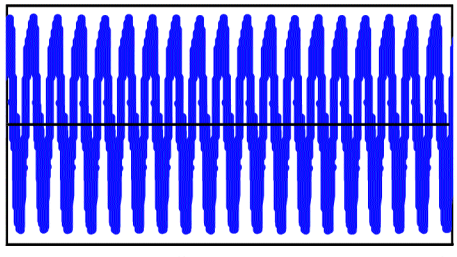

Figure 2. Commercial office buildings are a typical source of harmonic emissions.

To deal with power quality concerns, many leading utilities around the world are examining the economic impacts of the problem and revising their planning and operation practices. Many are also heavily involved in the establishment of equipment protection standards and regulatory guidelines, in the ultimate goal of minimizing the combined cost of supply and use of electricity by achieving a high degree of electromagnetic compatibility between the electrical service providers and the electricity end users.

To facilitate and coordinate these efforts, CEA Technologies Inc. (CEATI) has organized a Power Quality Interest Group, composed of electric utilities that pool their financial resources to sponsor power quality technology developments.

The Power Quality interest group is currently financing several key projects:

- Power Quality impact assessment of distributed wind generation
- Techniques for locating voltage sag disturbances
- Utility incentives and penalties for power quality under performance based Government regulation
- Assessing power quality disturbances using power quality monitoring features of distribution network equipment

Power Quality Impact Assessment of Distributed Wind Generation

With wind generation receiving increasing political and environmental attention, it is expected that the number and capacity of wind generation installations will grow substantially across North America. Many of these installations will be significant in size and will be connected directly to the distribution system. In these distributed applications it is quite common for turbines to be connected to rural distribution feeders that also serve load customers, and that may exhibit significant differences between the maximum and minimum loads. In such cases, turbines may noticeably influence the distribution feeder voltage, both in magnitude and in waveform shape, for either the benefit or detriment of the customers ser ved by the same feeder. The impact on voltage regulation, voltage flicker, and voltage unbalance is one of the most common limiting factors for distributed generation and especially distributed wind turbine generators. Under some circumstances there may also be a possibility of formation of isolated electrical islands, where the local feeder load would be supplied by the local distributed generators, but disconnected from the grid and its voltage and frequency-regulating influence. In such cases there is a danger of damage to the end user equipment due to possible overvoltages and frequency variations.

The above issues can be addressed quantitatively by using advanced simulation tools. Detailed computer simulation of representative commercial wind turbine technologies on typical distribution feeders would provide insight into the impact wind generation would have on rural distribution systems. Time- and frequency-domain system models could be used to quantitatively characterize wind turbine impacts on system voltage, with parametric evaluation of various feeder characteristics, wind regimes, and turbine technologies.

Because of the growing interest and penetration of wind generation, the CEATI's Power Quality Interest Group has initiated research that would identify the potential problems associated with wind generation and allow utilities to model and assess the potential impact of wind turbine generators on feeder voltage regulation, reliably predicting voltage flicker problems, voltage unbalance and harmonic emissions to ensure sustainment of high quality electrical supply to their customers.

The model will also allow sensitivity analysis of system impact on various types of wind turbine generators to ensure acceptable and reliable connections for the generators.

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Techniques for Locating Sources of Voltage Sag Disturbances

Utility operating experience indicates that momentary voltage sags are one of the most disruptive short duration power quality disturbances on customer operations. A significant amount of work has been done in developing protocols for measuring and indexing power quality disturbances, including voltage sags. However, relatively little work has been reported on the development of techniques for reliably identifying and locating the origins of voltage sags. In order to maintain an appropriate level of electrical service quality, utilities are increasingly interested in quantifying the individual contributions to the "aggregate" power quality problems and determining the level of responsibilities for such problems. In this context, the ability to locate the sources of voltage sags has become very important.

The existing technical literature describes several voltage sag source locating techniques. However, these have not been sufficiently tested and evaluated in the field to determine their respective advantages, disadvantages and limitations, and above all, their dependability in accurately locating the origins of voltage sags. For this reason CEATI's Power Quality Interest Group has initiated a project, aimed at evaluating various voltage sag source locating techniques and developing a practical, step-by-step implementation guide which will provide sound technical measurement tools and a methodology that could be readily used by utility staff to quickly identify and locate sources of voltage sags on theirs systems.

Utility Incentives and Penalties for Power Quality under Performance-based Government Regulation

In a regulated environment, the goal of public utilities is to provide safe, reliable, and least-cost service to consumers. To achieve this goal, regulatory commissions have traditionally relied on a cost-of-service/rate-of-return basis to determine appropriate utility rates thus permitting utilities to recover reasonable operating expenses and to earn a fair return on investment. In the deregulated market, however, utilities no longer have incentives to provide additional power quality or reliability service improvements. To remedy the situation there has been in recent years a considerable interest from utility regulators to entertain the well-known theory of performance-based rates. The expectation is that price-based incentive mechanisms will allow utilities to proactively invest in reliability and quality improvement initiatives. In several countries the price and penalty-based incentives for reliability improvement are already in effect, with regulators now looking more closely at measures for power quality improvement incentives as well. To prepare the participating utilities for the upcoming regulatory environment, CEATI's Power Quality Interest Group has initiated a study that would acquaint them with various power quality and reliability metrics and methodologies used in price-based incentive schemes. The main objective of this project is to provide sponsors with a detailed overview of how power quality and reliability performance-based rates are being implemented in other parts of the world. The final report will describe several options for measuring and predicting the value of power quality investments. It will also outline a framework for responding to price-based incentive mechanisms and creating the appropriate power quality and reliability metrics.

Based on an extensive analysis of the existing and proposed schemes that are currently being implemented in different parts of the world, the project will also outline the future role for utility power quality engineers.

Assessing Power Quality Disturbances using Power Quality Monitoring features of Distribution Network Equipment

Power quality disturbances are a real concern for both utilities and consumers. Detecting, recording and processing power quality data is crucial for monitoring network performance, and identifying and resolving power quality problems. In the past, such effort required installation of dedicated power quality monitors and communication channels for downloading the collected data for further analysis and archiving. Today's monitoring systems involve distribution network equipment already in place such as reclosers, voltage regulators and revenue meters, equipped with controls featuring a PQ option allowing for the recording and analysis of voltage and current signals to detect disturbances and to perform the statistical analysis of measurements. This approach to power quality monitoring will be much more cost-effective and allow for greater coverage of the distribution network. On the other hand, such a monitoring network will generate huge volumes of data, often in different formats, that will have to be processed, archived and displayed in order to provide useful information to the end users.

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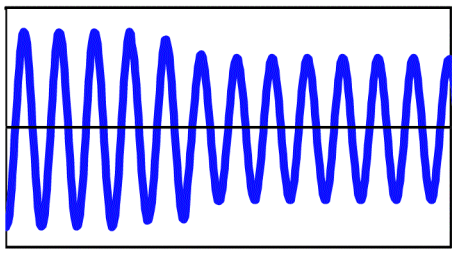

Figure 3. Wind farms may cause voltage regulation problems.

The CEATI Power Quality Interest Group has initiated a study that will provide utilities with a list of distribution equipment suitable for power quality monitoring, including a description of the methods used for assessing power quality disturbances. The report will include recommended monitoring equipment configuration suitable for recording and processing power quality information, including planning and operating requirements, and the methods for assessing and displaying the network power quality performance.

Joining Together To Fund Power Quality Research

The Power Quality Interest Group (PQIG) was established as one of the many "interest groups" of CEA Technologies Inc. (CEATI). The PQIG participants jointly sponsor studies and research projects in the area of power quality that will benefit them, the electrical utility industry and customers at large.

Participation in the group is open to all electrical utilities, power producers and government organizations that have interest in power quality related issues. The group identifies areas of common concern or specific problems, defines research objectives to solve those concerns. The individual group participants can then select to co-fund the projects of interest or benefit to their organizations. This flexible and collaborative approach provides substantial cost-benefit advantage to the participants. The products of the research are made available to the sponsors of the projects. ■

About the Author

Mr. Jerry Lepka heads CEA Technologies' Power Quality Interest Group. Mr. Lepka, a graduate from the University of Manitoba, has worked both abroad and in Canada managing complex technical operations and implementing new technologies. His most recent project was with the Gestore Rete Transmissione Nazionale in Italy, where he was a member of the Advisory Committee analyzing the causes of the September 2003 Italian system blackout and recommending preventive measures. At Ontario Power Generation, Jerry was involved in development of the performance-based Protection and Control Technical Training Program as well as Maintenance Strategies for their high voltage equipment. He also led Ontario Hydro's province-wide power quality monitoring program aimed at reducing system disturbances and their impact on electrical supply to major customers. For more information please visit www.ceatech.ca.

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Part 1
Trends in Mobile Field Information Management

By Jim Hargis, President, har*GIS Field Information Systems

There is no question that mobile technology is fundamentally changing the way people work and live. In the utility industry, developments in mobile technology have created large returns on investment through the delivery of zero-latency connectivity between the field and the back office. This has driven tangible returns in a wide variety of critical functions like outage response, safety and quality of service, the number of work orders completed each day, asset management, and the accuracy and timeliness of field operations.

This is Part 1 of a two-part article introducing a dynamic new segment of mobile information technology that is increasing efficiency of the field workforce across a broad array of applications. Spanning the front line of effective customer service, these applications embrace field user groups including service, dispatching, construction, operations, maintenance, engineering and delivery, all of whom require rapid access to large amounts of dynamic, up-to-date information from a variety of enterprise computing systems.

These systems include work management, outage management, enterprise resource planning, enterprise asset management, computer-aided design and spatial data management, and it is only through ready access to the data from these systems that mobile workers can complete, post and close jobs in real-time. This ability can not only dramatically improve the productivity of field operations across the utility enterprise, but it has the added benefit of extending the value and ROI of investments in corporate information and assets.

The widespread availability of hand-held computers, wireless communications, the introduction of Microsoft Windows/CE, new data compaction techniques and the continual evolution of more powerful, less expensive hardware have enabled mobile personnel to display large volumes of complex data from any number of mapping databases or Geographic Information Systems (GIS) on inexpensive, handheld wireless field devices. Dynamic downloads and uploads of all the customer, facility network, asset, and materials information can be efficiently completed for an unlimited variety of complex field operations.

Today's technology combines wireless communications, enterprise information systems and location-based services to deliver information and support to mobile field crews and dispatchers using standard computers. Integrated GPS and location-based services graphically display the location of work to be completed, map out the best route to each location, guide the mobile worker to this location and then provide all the information needed from the customer information system, work management system, outage management system, enterprise resource planning, enterprise asset management, computer-aided design or other enterprise systems so field activities can be completed, posted and closed in real time.

Before focusing on specific technology trends that are impacting the use and viability of mobile solutions for the utility industry, let's look at the business case for field information management.

Why Field Information Management?

A large percentage of the utility work force (30-50% according to several estimates) spends some or all of their time outside of the office, working in the field or supervising and supporting field workers. Reviewing their field workflow functions, there is significant time and activity spent on non-productive tasks or overhead—often estimated at 20-30%.

Typical "wasted" time includes travel or "windshield" time getting to and from work locations, redundant visits to nearby or identical locations by different crews at different times, filling out paper forms and then keying them in again at the office, errors and rework caused by inaccurate office records not matching the "field truth," maintaining multiple records of field information for different office uses, and above all, the creation, duplication, distribution, access and updating of large quantities of paper records, most of which contain listings from office computers and databases. Meanwhile important field information may be desk-bound in the office computer or database.

New mobile technologies are finding ready application and quick payback in individual tasks such as forms entry for asset management, GPS for facilities location and survey, wireless communications instead of communication via paper, CD or wired connection, even work status and time reporting. The cost/benefit is obvious, but the risk of change is high.

Obviously, most software developers and office staff use keyboard-based systems and are proficient with using personal computers for a large part of their job. Conversely, many field users wear gloves, work in adverse conditions and do not have a tolerance for finicky computers with hard to use software or systems that lock up. Traditional computers and user interfaces are nearly useless to field users, as evidenced by most "mobile computers" sitting unused in the truck most of the day.

What's needed – and what modern technologies enable – is the unique combination of mobile technology integrated with the field user's environment and work flow. These technologies are discussed in the paragraphs that follow.

Mobile Computers

A few years ago, the standard perception of mobile computers was a lap-top or "ruggedized" PC, typically with its baggage of unreadable screens, tiny menus and buttons, and unreliable

operations. The recent deployment of daylight-viewable screens, touch-screens, voice prompting and even character recognition have certainly improved the usability, as has the ever-increasing power of these systems. However, the fundamental trend in mobile computing is toward a variety of custom "form-factors" and vertical applications designed specifically for field use.

The traditional Microsoft operating systems have been extended to support tablet PCs. The new series of "embedded" software has evolved and been extensively distributed since Microsoft's declaration of support for "ubiquitous computing," resulting in Windows CE devices dominating the "Palm" in mobile business platforms. These contain field versions of office packages for word processing, spread sheets, slide shows email and internet.

Ranging in size from a small calculator to a full page display, these devices feature wireless connections to printers, modems, GPS, scanners, projectors -- with or without keyboards, character recognition, voice response, integrated I/O, gigabytes of stamp-sized memory, built in cameras, telephones and wireless networking.

Many utility IT groups have chosen to stay with the traditional ruggedized laptop PC and appear reluctant to support unfamiliar operating systems and hardware in the handheld computer market. However there is a strong trend in the software suppliers to provide true systems-level integration of the small platforms with traditional corporate applications. Meanwhile, the IT industry shows a strong move from custom applications to reusable, vendor-independent product software enabling a choice among a variety of different handheld computers optimized for field use.

Major manufacturers (HP, IBM, Panasonic and Intel) now have entire hardware lines dedicated to mobile and wireless computing, supporting the trend away from one-size-fits-all to individual computing. There are now more than 100 manufacturers of handheld mobile computers, compared to a couple dozen just a few years ago, with the trend toward convergence – providing more capabilities integrated with phone size devices, ever-smaller, more integrated and simpler for the user.

In the utility industry, handheld devices exist now complete with software for surveying, field data collection, vehicle location, customer contact management, laser scanners, RFID supply chain management, meter reading, imaging and many other applications, and the list will continue to grow as the utility industry evolves to embrace more ubiquitous platform software, with its many benefits.

Today mobile handheld applications tend to be standalone, and either small and inexpensive (calculator-like) or customized systems and applications software for specific vertical applications. Systems development on platforms is still expensive, so re-use becomes critical for economic viability. Mobile solutions have to be templated, repeatable, configurable solutions that reduce risk and speed time to deliver business benefit, customizable without software development and easy enough for user configuration and customizing.

Wireless Communications

As Hewlett-Packard stated, in the mobile enterprise, the office is everywhere. Requirements of remote workers extend the enterprise edge. Best-in-class mobility is meaningful—and achievable—for enterprises of every size and type. So why aren't more enterprises fully enabled today? Because, while mobile solutions should be simple to use and quick to adopt, they are rarely simple to build.

Wireless Wide Area Networks (like cellular phones) and Wireless Local Area Networks (like WiFi) have experienced tremendously increased performance over the last few years, driven by wide-spread adoption of faster/better/cheaper improvements.

Wireless Local Area Networks have essentially been commoditized based on WiFi and its derivatives, offering performance up to 56 MHz, easy installation in the home and office, with and receivers built into most mobile computers. WiFi will essentially eliminate the need for data transfer by other means, if the mobile information software supports the interface.

According to In-Stat/MDR, a global wireless market research firm, some 16 million notebook PCs with embedded WiFi will ship to businesses by year end 2004, and by 2005, WiFi will be included in 95% of notebooks as a standard feature.

Wireless Wide Area Networks(digital cellular) has finally made substantial progress toward reaching the high-speed, "3G-type" technologies and performance that have been so widely anticipated for several years. Coverage is still spotty and likely to remain so for the near future, so the mobile field user cannot depend on having constant Internet access, unless the company or the city builds its own digital radio or broad-band network (as for instance, the City of Denver Ricochet wireless, or the City of Philadelphia municipal broadband award). Unfortunately, Telecom carriers are still split between incompatible GSM/GPRS-based standards and CDMA-based standards, each with incompatible upgrades to high speed digital data service. (Please refer to Table 1 for a guide to alphabet soup of modern telephone wireless industry).

WiMax. A new wireless giant has emerged and is now being tested. WiMax, (which has nothing to do with WiFi) is also known as the IEEE 802.16 standard, the "Air Interface for Fixed Broadband Wireless Access Systems" and the IEEE WirelessMAN* air interface. The term WiMax (Worldwide Interoperability for Microwave Access) has become synonymous with the IEEE 802.16, which is designed to provide wireless "last mile" broadband access. WiMax provides a wireless tower with a range of 1 to 10 miles supplying high speed broadband connection to computers, similar to DSL and cable. It provides a cost-effective fixed wireless alternative to conventional wire-line DSL, Cable or T1/E1 leased line in areas where those technologies are not readily available, and without the installation cost of fiber /copper lines.

WiMax Forum, a group of vendors and service providers, initially will certify products based on the 802.16d standard, designed for wireless base stations with a range as long as 50 kilometers (km). It is a point-to-multipoint technology, so it doesn't require a direct line of sight to the customer. A later version of the standard, 802.16e, will provide a relatively simple upgrade to access points to support mobile customers. The 802.16d standard should be essentially complete and approved in March certify service provider equipment starting the first quarter of 2005.

GPS

Compared to five years ago, GPS technology has reached consumer commodity levels, with mobile applications incorporating it routinely. From surveying to hiking, farming to construction, asset location to driving a car, GPS is ubiquitous and cost-effective, thus saving time and improving safety and security. The only real restrictions have to do with receiver accuracy and availability of signals used. These determine the answer to "where am I".

A "constellation" of 24 satellites maintained by the Dept. of Defense provides the signals.

GPS provided only three navigation signals, and of the three signals, only the L1 C/A signal was designated for civil use. The Department of Defense added a new civilian signal (L2C) to "modernized" satellites starting in 2004. Although it will be several years before sufficient satellites are deployed with this new signal, the L2C is likely to become the signal of choice for applications like wireless emergency 911 (E911) positioning inside buildings, personal navigation in wooded areas or vehicle navigation along tree-lined roads. If so, embedded GPS in wireless phones alone would make L2C the most widely used of all GPS signals.

RFID

Radio frequency identification, or RFID, is a generic term for technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a serial number and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID tag). A reader sends a radio signal, the tag responds, and the reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers.

RFID technology has been around since the 1970s for tracking items on the move and security badges. Either the reader or the badge can be mobile. The reader records a radio signal identifier sent from the tag when it is within 1-10-100 feet of a reader, depending on whether the tag is active or passive. The big driver is the recent dramatic drop in costs of readers ($1,000) and tags ($0.20), which make the devices cost effective in supply chain management simply by being able to track each pallet, box or asset.

The impact on mobile computing is not just a new type of input to the mobile system (like a bar code), but rather a way of adding computer-readable intelligence to "dumb" assets. If RFID asset is combined with the spatial location, you could display a 3-D layout of the yard or warehouse holding the tagged equipment. Tagged equipment could automatically report being loaded onto truck, as well as when it's installed or replaced, and provide the data to answer questions like "where was transformer 192-12-55 last reported?"

Combining RFID and wireless LAN software, IT staff can accurately (within 10 feet) track any 802.11 mobile devices with an active RFID tag as they move throughout a wireless network inside a building with appropriately positioned access points.

Conclusion

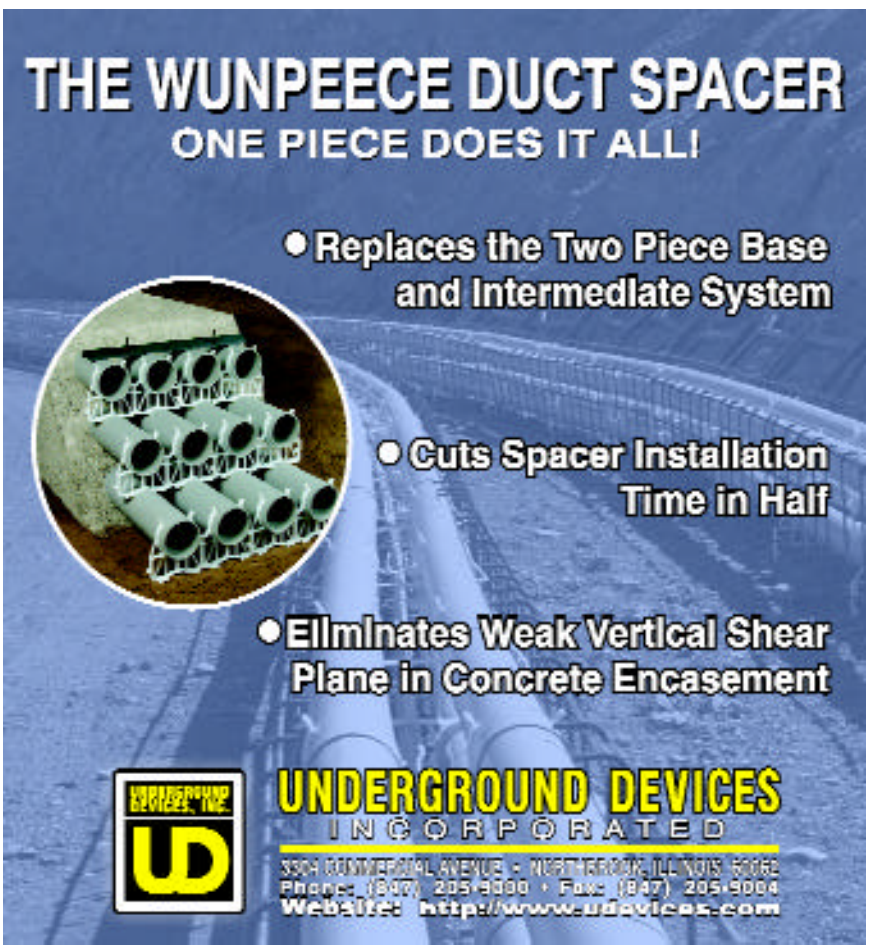
It is obvious that the hardware side of technology for mobile applications has exploded in recent years. Although many new applications are technically feasible, the critical success factor is the user's "gloves-on" acceptance. This requires software to effectively harness the tools in a manner that is easily used and controlled by the field user or dispatcher, and easily interfaced to other, multiple, disparate information systems. Obviously, a truck full of gadgets will be rarely used, difficult to support and impossible to integrate. Thus, the fundamental work tasks need to be supported together and fully integrated. If software is not carefully architected for compatibility and expandability, we can easily end up with a jacket full of individual mobile hardware apps, which of course would not be used.

This article, Part 1 of the two-part series, focused on specific technologies that have been successfully deployed in a wide variety of industries. We described the changes currently underway that will fundamentally change the way the modern field crew does its work efficiently.

Part 2, which will appear in the March/April edition of this magazine, will explore the new software and system technologies critical for success of field information management. ■

About the Author.

Jim Hargis is president of har*GIS Field Information Systems, developer of the TruckMap* Field Information System™ (www.truckmap.com). His 30-year career has been dedicated to the innovation, design, development and implementation of spatial and mobile technologies for more than 200 utility companies and local governments. Prior to founding har*GIS Field Information Systems, he was actively participated and invested in the start-up of several industry-leading companies, including Convergent Group, Intergraph Corp.'s Utility Group and Computer Graphics Company. Mr. Hargis holds a BS in Physics from Rice University and an MBA from the University of Denver. He is a past Board member of GITA and has contributed a dozen papers, presentations and seminars. Mr. Hargis has developed and patented essential technology for automated map generation from facilities databases. Mr. Hargis can be reached at jhargis@har-gis.com or by phoning (303) 220-0253.



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Technology Trends Bringing Customer Information Technology to the Masses

By Bobby Abraham, CIO, Innoprise Software, Inc.

Customer self-service, online bill presentation and payment, automated workflows, complex rating and billing..... It's a brave new world out there. The Internet revolution has set new customers expectations concerning the speed at which answers should be provided to their utility service questions. Along with escalated customer demands for better, faster service, utilities are also faced with continual changes in energy legislation, complex rate structures and the need to offer customers the expanded set of product and service offerings required to remain competitive.

It's a very real fact that business success today is highly dependent on the effectiveness of the customer information systems (CIS) being used for processes like billing, customer relationship management and service order management – processes that are at the heart of the utility's ability to meet today's business requirements by getting the right information to the right people at the right time.

Unfortunately, the ever-present regulatory and customer care realities facing utility management today were never factored into the design of CIS technology developed many years ago at a time when utility business models were inwardly focused on internal operational processes as opposed to meeting changing customer and legislative demands. Because many utilities have invested millions of dollars in this technology and have built large, complex databases around these legacy CIS solutions, many are still trying to stretch the limitations of obsolete technology to meet the needs of a market for which they were never designed.

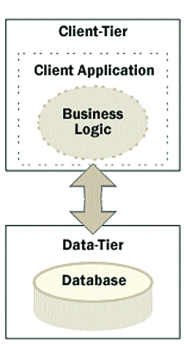
At a time when utilities are looking for ways to reduce operating costs while improving customer service levels, legacy CIS systems often require significant and costly technical support just to meet day-to-day operational needs. The interfaces that have been developed in recent years to keep the systems functioning are convoluted and complex, and upgrades and customization are time-consuming, thus draining both resources and profits. Furthermore, gone are the days when system maintenance expenses could simply be passed on to the customer.

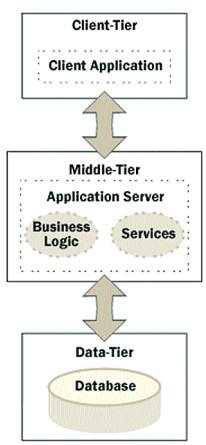
One of the most significant problems resulting from the monolithic approaches to CIS that characterized system architectures of yesteryear is the disconnect between the customer and the revenue flow. These systems are unable to maximize billing accuracy and service reliability while minimizing customer service costs and accelerating cash flows. In an industry characterized by performance-based rates and constantly scrutinized for service efficiency, this is simply unacceptable.

Patch or Replace – the CIS Paradox

These issues have left many utilities in a quandary. Efforts to enhance efficiency and improve customer care have focused, until now, on patching legacy systems. In recent years, however, it's become readily apparent that no matter how much effort is put into creating band-aids for these systems, they are no longer capable of providing the functionality needed in today's evolving market. When a simple request for a new FERC report requires hours of IT programming support and the need to accommodate new tariff and billing structures simply can't be met, continuing to customize and repair these aging legacy systems is becoming less and less viable, particularly as the ROI of this approach continues to decrease.

Fortunately, counterbalancing this scenario is the fact that modern technologies are dramatically changing the CIS software picture. As might be expected, the Internet has had one of the biggest impacts. An excellent solution for the integration challenges that have faced utilities seeking to bring together the data sets from the many systems underpinning customer care,





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modern Internet architectures also offer scalable, multi-channel, flexible and agile development options, thus dramatically reducing development costs and timelines. This, in turn, has brought the costs of new CIS technology down from an average cost of $50 per meter just a few years ago to a much more reasonable $10 - $15 per meter today.

Internet integration architectures embracing XML, service-oriented architectures (SOA), web services, web applications servers and advances in wireless technology are taking CIS to the next level of flexibility, functionality, ease-of-use and affordability. For utilities facing challenges integrating their CIS to other applications within the utility enterprise -- for example, work management, outage management, asset management, and back-end financials -- newer technologies and applications frameworks are enabling better integration across the utility enterprise.

From Client/Server to Web Applications Server

One of the key technology trends is the replacement of the client/server model of previous years with web-based applications servers standardized around Microsoft.NET and Java‘ 2 Enterprise Edition (J2EE) development platforms. The rigid architecture of the client/server model, with its accompanying rigid processes, is rapidly giving way to the flexible architectures and processes of web application servers, which, as a result, have become the platform of choice for CIS and other enterprise applications.

These platforms enable developers to connect data, people, systems and devices much more easily and in a much more straight-forward manner than ever before through the use of web services. Small, discrete building block applications that connect to each other as well as to other, larger applications over the Internet, web services allow programs written in different programming languages and on different platforms to communicate and share data through standard Internet protocols such as XML (extensible markup language) and SOAP (Simple Object Access Protocol). As a result, the primary benefit of web services comes through greater interoperability and flexibility in application development. Because they provide a more flexible, loosely coupled way of linking software applications, they allow applications to share information without being directly integrated because any application can be integrated with any other application so long as the two are web services capable.

As application servers like J2EE and .NET have become the preferred platforms for enterprise applications, the concept of a service-oriented architecture driven by web services, has become increasing pervasive. In fact, according to Gartner, "The single, most-important theme in modern application development is the service-oriented architecture." Gartner estimates that by 2008, more than 60 percent of enterprises will use SOA as a "guiding principle" when creating mission-critical applications and processes. In fact, Gartner says, "Enterprises that deploy service-oriented business applications through 2008 will realize average process productivity gains of more than 20 percent and cost savings of more than 15 percent by fusing dissimilar applications and breaking down structured and nonstructured information silos."

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In sharp contrast to legacy approaches to CIS, an SOA makes it much easier to access customer information using a blended service-delivery model encompassing telephone, Internet, self-service kiosks, as well as mobile and wireless devices.

Rick Nicholson, vice president and director of energy information strategies for leading utility analyst META Group comments, "In my mind, web services and service-oriented architectures represent the next level of software componentization and application integration." Nicholson theorizes that, "You could implement a CIS in pieces more easily using this type of an architecture. For instance," he says, "if you had a legacy CIS and needed to replace the credit collection or accounts receivable modules, this type of architecture would make it easier and less expensive to do that without wholesale replacement of the entire system."

The bottom line is that SOAs leveraging J2EE or .NET, combined with web services, enable customer management processes to obtain a single, consistent view of all customer information, whether from a local database or remote system anywhere in the enterprise. Such an architectural backbone offers powerful cross-functional capabilities that enable a wide variety of applications across the full spectrum of customer interaction to access the same data set using numerous available touch points.

Customer management, billing, work management, marketing and other customer-oriented business processes are therefore unified, customer intelligence is dramatically enhanced and integration with other applications is simplified.

This makes it much easier and faster to add new services, products and rate structures as business needs and regulatory demands change. It also provides built-in functionality for advanced features such as customer self-service, online bill presentation and payment, and complex rating and billing. It enables utilities to more easily bill customers for unlimited products, such as cable, Internet, home security and any other product or service that the utility may diversify into. Furthermore, it provides the flexibility to quickly and seamlessly accommodate each utility's evolving and unique business rules.

Business Process Management

The standardization of application servers and web services has given rise to a set of standards related to business process management or BPM. These standards, when combined with service-oriented architectures, can create a dynamic synergism that extends the capabilities of both technologies. "Business process management is an outgrowth of the of the enterprise application integration software trend, but with the addition of business process modeling and automated work flows," comments META Group's Nicholson. "For utilities wanting to model and manage an end-to-end business process like service order management," he explains, "business process modeling makes achieving this goal much more efficient, from the time a customer first contacts the call center, through scheduling the appointment, securing the necessary resources, dispatching the work crews, completing the job and updating the account record."

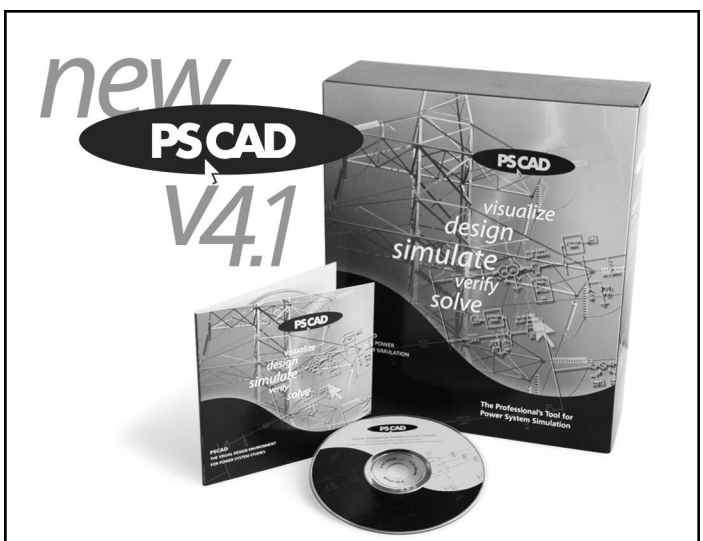
"If utilities can overcome the cultural boundaries needed to agree to cross departmental borders and thus leverage the benefits of BPM, the ROI is potentially quite high," Nicholson notes.

Adding Customer Analytics

Combining an SOA and new business process management standards with customer analytics and real-time intelligence is another trend that more fully enables utilities seeking a strategic advantage. "While we see more activity in this arena in Europe because of the higher level of competition there," says Nicholson, "customer analytics and business intelligence are important technology trends among utilities seeking to better understand their customers, their behavior and how this impacts their desire for products and services."

In today's business environment, utilities need more intelligent information to stay competitive as well as to comply with regulatory directives and legislation. They also need a single view of the customer across various dimensions.

While a legacy CIS houses all data pertaining to end customers, theses systems were architected as transactional systems and are not well-suited for analyzing the data they contain. While interaction with the end customer is handled through the CIS, a single view of the customer does not exist in the CIS, which in most cases is data rich but information poor. This makes it difficult to



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framework that enables flexible user-defined analysis using a single view of the customer. This view combines customer information, customer account management, service account management, installed service, site meter reading, billing, payment, collection and other customer parameters.

The next step would be to create digital dashboards and reports appropriate to the needs of individual stakeholders. Such a solution allows for cross-subject area analysis, leading to a better understanding of the customer, improved customer service and the ability to create more targeted products and service offerings. It also provides the analysis tools and data required for regulatory reporting and compliance with legislation such as Sarbanes Oxley.

gain insights into customer behavior as users are unable to query the data in an ad hoc manner as a means to identify patterns and analyze root causes for key issues like slow payment, overdue bills, collection potential and cross selling. In addition, today's legislation mandates that utilities today more stringently monitor their data and business practices and develop performance benchmarks.

The trend, therefore, is toward an approach to analytics based on a robust data warehousing

Utilities are Going Mobile

Improvements in wireless networks, device technology and device-based services that have occurred during the last few years have made mobile approaches to customer care and work order management possible, resulting in an explosion in the usage of mobile technology. Wireless solutions allow both individuals and organizations to connect to the Internet at any time, from almost any place, via wireless devices, including cell phones, personal digital assistants (PDAs), pagers and laptops. In fact, Yankee Group anticipates that the number of people using the wireless Web will reach over 200 million by 2005, and the number of people using mobile data services is expected by ARC Group to grow to 1.187 billion by 2005. Mobile solutions for customer information management are essential to allow utilities to improve field productivity and mobile workforce management, provide better customer service and respond more readily to outage situations, while keeping operating costs at a minimum.

Summary

As the hub for customer-facing and revenue cycle processing activity within the utility, the CIS is a mission-critical enterprise application that often represents up to 30 percent of an energy company's application budget. Fortunately, the state of the art in customer information software is changing, the functional capabilities of CIS are increasing and the costs are going down, bringing CIS technology within the reach of any size utility. Innovative software, based on new standards – particularly web platforms, architectures and services – is fostering new, more efficient solutions that enable utilities to respond more nimbly to industry changes and overcome the integration challenges that have long been obstacles to achieving optimal customer service. Today's utility is seeking flexible systems that help streamline business processes and reduce total costs of ownership. The new technologies that are rapidly becoming de facto standards in design of new CIS solutions are making these goals an achievable reality. ■

About the Author

Bobby Abraham provides strategic and tactical planning for Innoprise's Next Generation product suit. Mr. Abraham is responsible for Innoprise software development and works to ensure that the myriad of software requirements of utility and municipality customers are incorporated into new versions of the various Innoprise products. Mr. Abraham also evaluates the relevance of new technologies, development methodologies and processes and how they can be best utilized by Innoprise Software. When parted from his notebook computer he can often be found rock climbing.

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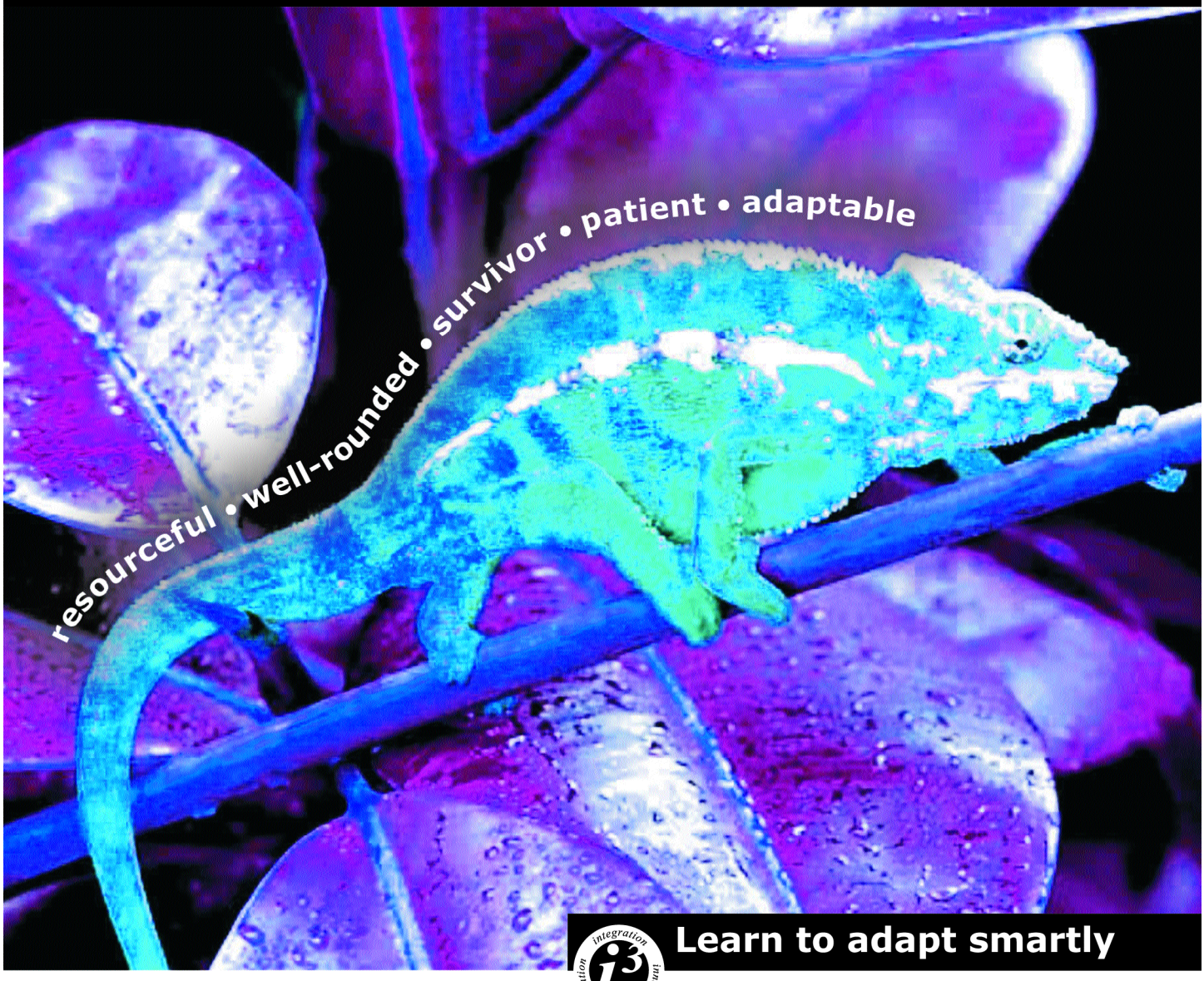

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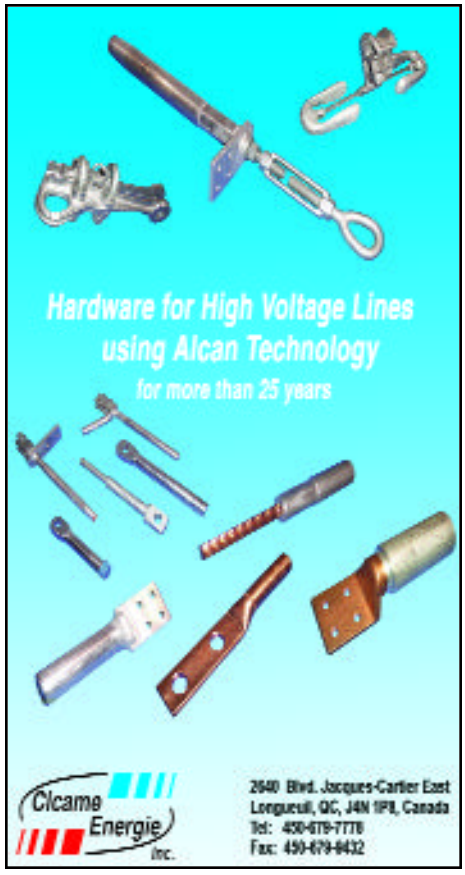

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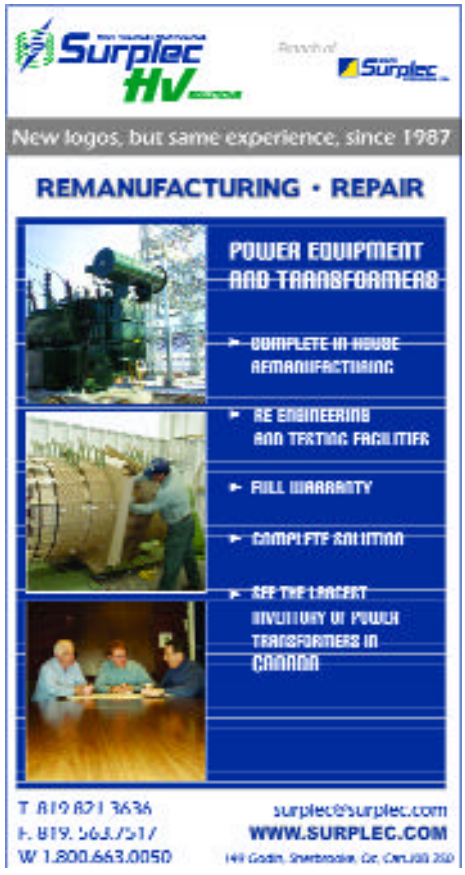

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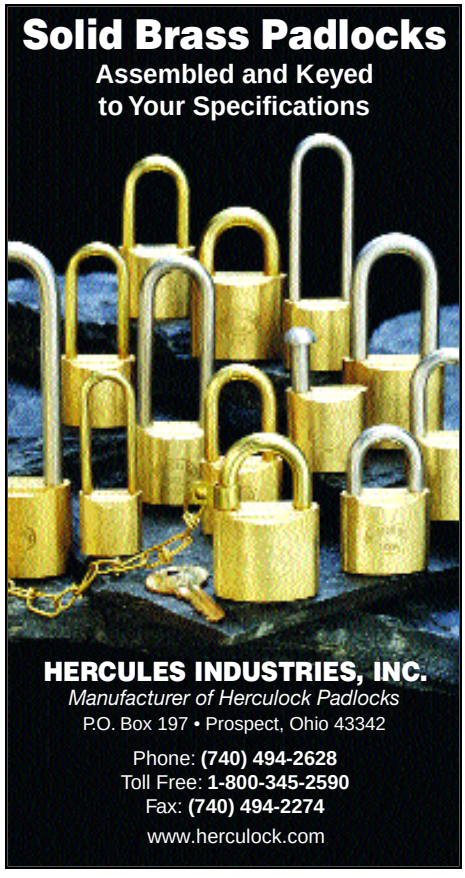

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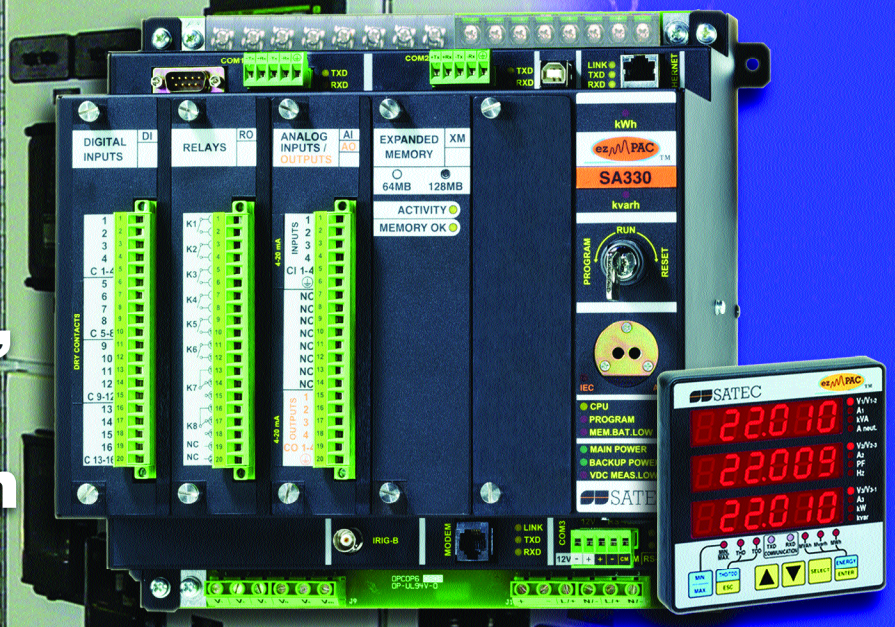

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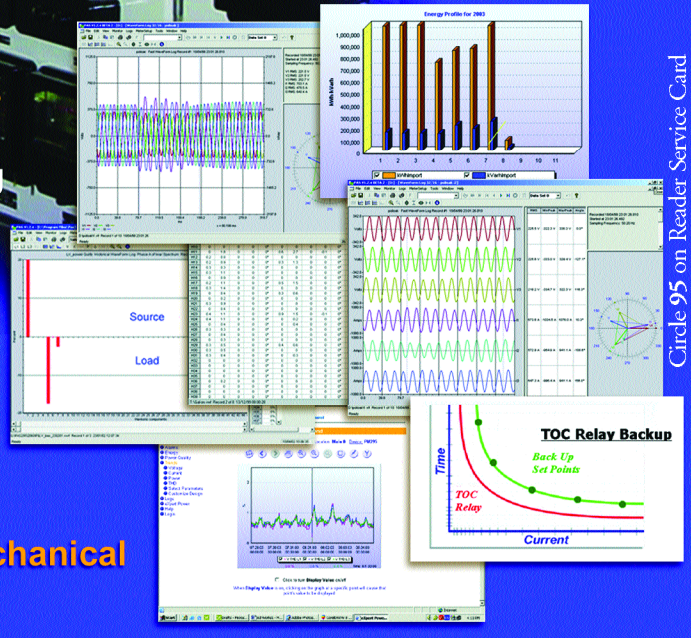

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