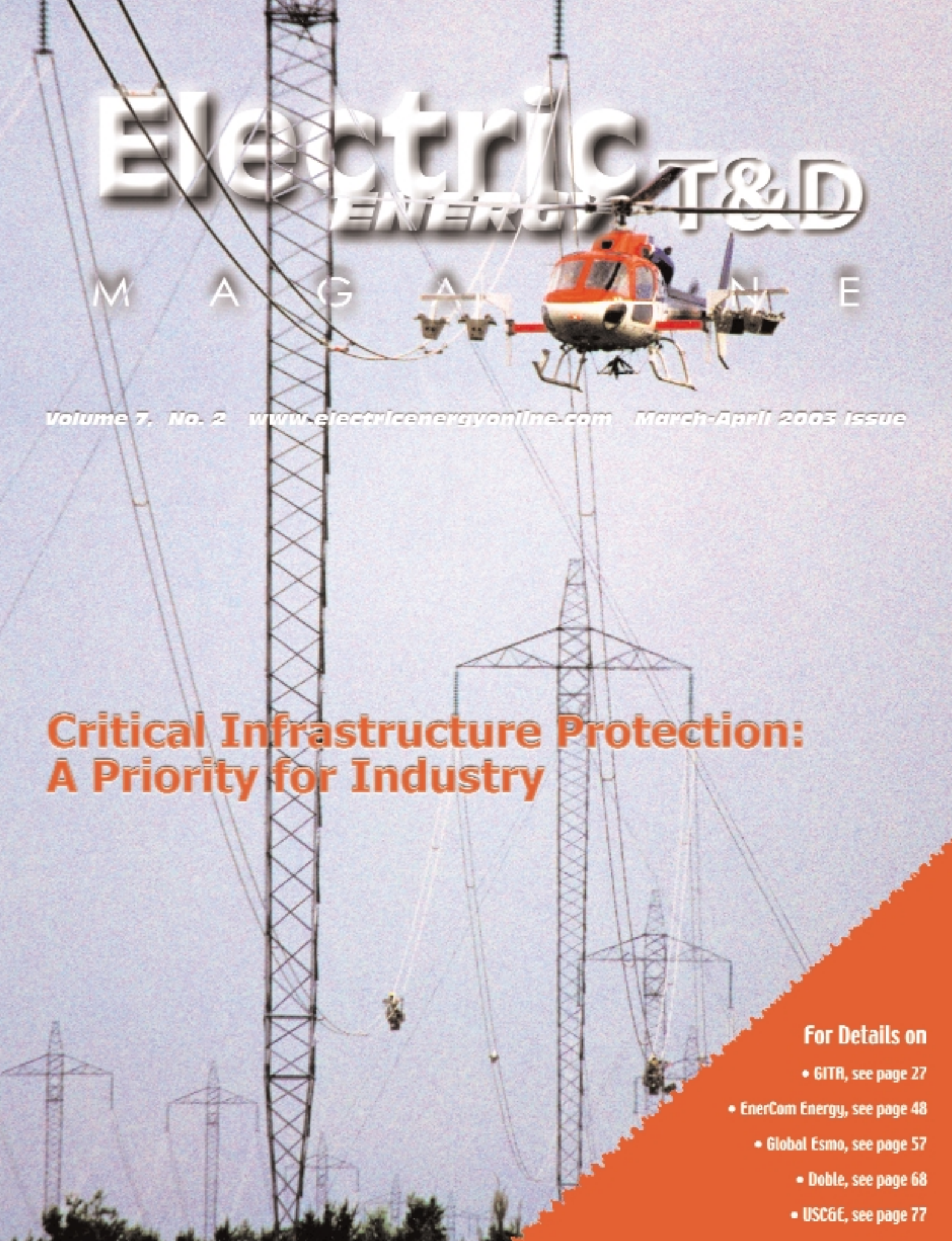
Electric Energy T&D MAGAZINE



Volume 7, No. 2 www.electricenergyonline.com March-April 2003 Issue

Critical Infrastructure Protection: A Priority for Industry

For Details on

- GITR, see page 27
- EnerCom Energy, see page 48
- Global Esmo, see page 57
- Doble, see page 68
- USC&E, see page 77

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8 **Industry News**

27 **GITA Annual Conference & Exposition**
March 2nd-5th, San Antonio, TX

48 **4th Annual EnerCom Energy Conference & Expositon**
March 4th-5th, Toronto, ON

57 **Global ESMO 2003 (IEEE-PES 10th Conference)**
April 6th-10th, Orlando, FL

68 **2003 International Conference of Doble Clients**
April 6th-11th, Boston, MA

77 **Utility Safety Conference & Expo**
April 23rd-24th, San Antonio, TX

79 **Product Showcase**

80 **Advertisers Index**

Electric ENERGY T&D MAGAZINE

In this Issue

4 ..... **Critical Infrastructure Protection: A Priority for Industry**
Potential threats to the continued supply of electric power can come from many quarters and can take many forms.

14 ..... **Upgrading Transmission Lines with Aerial LiDAR Technology**
A SaskPower case study using helicopter surveys to collect data for line modeling
In today's changing utility environment, one thing remains constant - electric utilities are continually looking for better ways to increase transmission capacity to satisfy the ever-growing demand for power.

18 ..... **Principles of Arc Flash Protection**
Complying with the Electrical Safety Standards
There have been several recent developments in the standards of Electrical Safety.

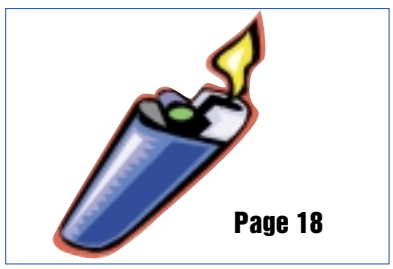
22 ..... **What's Next for GIS and Mobile Computing?**
A lot has changed since my first involvement with the AM/FM/GIS over two decades ago.

42 ..... **Topic: PILC cable – We're still living with it**
In spite of all the rhetoric about "getting the lead out", most larger North American urban centers are still maintaining some form of medium voltage underground network power distribution system using paper insulated, lead covered (PILC) cables.

50 ..... **Recent Developments in the GPS / DGPS Environment**
Developments in GPS (the Global Positioning System) and DGPS (Differential GPS) over the last few years have greatly changed the options for geo-location procedures in the survey and utilities mapping industry.

60 ..... **From Checkers to Chess - Enterprise GIS - The High Stakes Solution for Utilities**
Comparing the utility industry ten years ago to the industry today is like comparing checkers to chess.

74 ..... **Utilities Pull Together to Design Latest Storm Management Software**
It's no secret global weather patterns are changing dramatically with larger, more violent, and further reaching storms of all types and in all seasons slamming communities more frequently and randomly.



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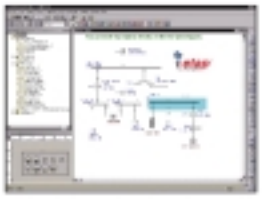
Live Line work on 500 KV in Manitoba, Canada

The Rules Haven't Changed Just the Tools to Apply Them...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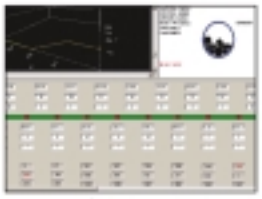
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Critical Infrastructure Protection:

A Priority for Industry

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

Potential threats to the continued supply of electric power can come from many quarters and can take many forms. While the terrorist attacks in the United States on 11 September 2001 raised the profile of the need to protect critical infrastructure from malicious attacks, physical damage to infrastructure can also be the result of natural phenomenon, including weather related events such as storms and flooding. Cyber threats also exist, and the potential impact from computer viruses, worms and other attacks to IT resources must be safeguarded against.

How does the electricity sector define critical infrastructure protection? Critical infrastructure protection means safeguarding the essential components of the electric infrastructure against physical and electronic cyber threats in a manner consistent with appropriate risk management, with both industry and industry-government partnerships, while sustaining public confidence in the electricity sector.

A North American Approach

The North American electric power industry, through the North American Electric Reliability Council (NERC), seeks to safeguard the North American bulk electric power system through a variety of activities, principally through the Information Sharing and Analysis Center for the Electricity Sector (ES-ICSAC). The ES-ISAC serves the electricity sector by facilitating communications between electric sector participants, federal government and other critical infrastructure industries. It is the job of the ES-ISAC to promptly disseminate threat indications, analyses, and warnings, together with interpretations, to assist electricity sector participants take protective actions. On a North American basis, most critical infrastructure industries have established an ISAC to communicate with members, government partners, and other ISACs about threat indications, vulnerabilities, and protective strategies. ISACs work together to better understand cross-industry dependencies and to account for them in emergency response planning.

The Canadian Electricity Association (CEA) is an active participant in the ES-ISAC and in the NERC CIP Advisory Group. CEA works cooperatively on a continental basis with a range of partners through NERC, including other industry associations such as the Edison Electric Institute (EEI) and the American Public Power Association (APPA), to ensure coordination and effective CIP program delivery for the electric power sector.

Consistent with the NERC approach, the focus of CEA activities includes both physical and cyber threats to infrastructure. Physical damage, either from natural or malicious means, is easily understood. Recent ice storms, flooding, hurricanes, as well as the September 11 terrorist attacks have served to raise industry and public awareness of the potential impact physical damage may have on infrastructure. Less difficult to quantify is the potential impact of cyber attacks.

While industry is better prepared to both in terms of early warning and in response to cyber incidents, the fact is the frequency of cyber attacks is on the increase. And while the names of some viruses and worms are widely recognized by most people, think of NIMDA, Goner, the so-called Love-Bug, and the recent SQL-Slammer worm, the impact on the economy is anything but ordinary. Computer Economics, a technology consultancy, reported that viruses cost the U.S. economy $13,2 billion in 2001, due mostly to computer network crashes and time spent purging systems of the digital infections.

To date, there has been no loss of service to electricity customers as a result of these cyber incidents. However, as the January 25th SQL-Slammer worm incident showed, infrastructure is vulnerable to cyber attacks. The SQL-Slammer worm resulted in a degradation of service in a number of sectors, including financial services, transportation and telecommunications, and due to the inter-dependent nature of infrastructure, some electric power operators felt the impact of the worm through these inter-dependencies.

Clearly, the increasing frequency and impact of cyber-based attacks coupled with the electricity industry's growing dependence on e-commerce and electronic controls means that risk mitigation in this area is a very significant CIP challenge.

Canadian Activities

In January 2000, following the successful Y2K transition, CEA members formed the Critical Infrastructure Protection (CIP) Working Group in order to coordinate activities, share best practices, and interface with the federal government. In its first year-and-a-half of activities it had established an effective information sharing Intranet site, implemented methods for coordinating activities with the North American Electric Reliability Council (NERC) and other partners, developed and implemented an Early

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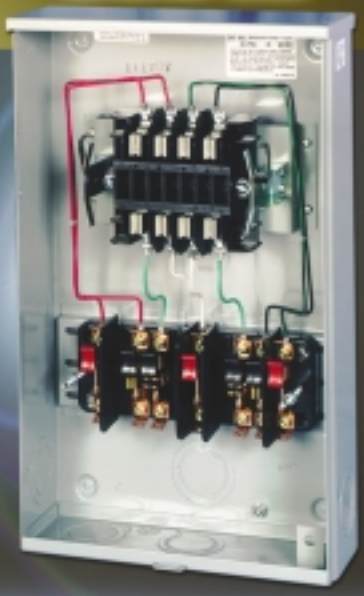
E.J. Brooks High-Security Padlock Seal features an acrylic body with an 1/8"-diameter steel hasp. Ideal for securing both ring and ringless style meter sockets.

The profile of Ekstrom's LP Series extender adapter is only 1.2"; 4-8 jaw models; accepts phone lines for direct access, MOVs for surge protection, relays for load controls.



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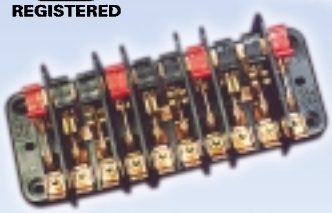

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Warning System for threats to electricity infrastructure, and worked closely with the federal government.

Today, all CEA Councils and Working Groups use the CEA Intranet to facilitate their activities. But in early 2000, the CIP Working Group was the first to begin actively testing the Orchestra platform, developed by Ottawa-based Crossdraw, intended to facilitate on-line coordination and cooperation. The initial test was a success, and the CIP section on the CEA Intranet continues to expand and includes: an electronic filing system for key documents; issues monitoring information; an area for on-line discussions; and the alerts and advisories sent by the Canadian federal government as well as those from the Department of Homeland Security's National Infrastructure Protection Center.

Early Warning

The Early Warning System (EWS) developed by the CIP Working Group is a model being looked at by other sectors as a fast and efficient method of communicating information in times of high alert. CEA's EWS uses the Internet, email, web-enabled cell phones and Blackberry handheld devices to deliver real-time threat information to members on a 24/7 basis.

The value of the network provided by the CIP Working Group provides was in evidence on 11 September 2001. A CEA delegation was meeting with Energy Ministers that fateful morning. When initial reports began coming in, the scheduled meeting was suspended in order to focus on the events in New York and Washington, and their potential impact on infrastructure. In a matter of minutes, CEA President Hans Konow was able to report to Ministers and officials as to the state of the grid, the level of alert electric utilities were moving towards, and the types of security measure which were being implemented as a result of the alert.

On January25th of this year, as IT specialists first began to see the SQL-Slammer worm impacts, CEA members were notified and were able to take remedial action. Speed of response was critical. This worm spread around the globe in less than 10 minutes, and unlike the "Code Red" worm of 18 months previous which doubled the number of computers it infected every 37 minutes, Slammer initially doubled the number of computers it infected every 8.5 seconds.

A computer security research group led by the Cooperative Association for Internet Data Analysis (CAIDA) noted that while SQL-Slammer was a simple worm, it "represents a significant milestone in the evolution of computer worms. It clearly demonstrates that fast worms are not just a theoretical threat, but a reality — one that should be considered a standard tool in the arsenal of an attacker."

Ensuring Protection

While the above highlights some of the risks and corresponding actions the electric power industry has taken to mitigate those risks, individuals have a role to play as well. All companies have guidelines for both physical and IT security. It is essential that company staff be aware of the risks and potential threats and that they are familiar with standard company and industry policies and procedures for dealing with potential threats to infrastructure.

Through NERC, the North American electric power industry has developed a series of guidelines for the protection of critical assets. These guidelines cover both physical and IT security and can be used by CIP facility operators as a "best practices" guide. They can be accessed on the ES-ISAC Website at www.esisac.com. ◆

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Industry News

Aerotec, LLC: Enabling Advanced Engineering Mapping and Modeling

Thanks to recent advancements in the application of Light Detection and Ranging (LIDAR) technology, it is now practical to acquire very accurate, dense, uniform digital terrain model (DTM) and facilities location/geometry data from an airborne platform through laser distance measurements. When integrated with airborne GPS and inertial measurement systems, LIDAR can capture DTM data with accuracies of ten to fifteen centimeters without GPS land surveys. Aerotec has mounted its laser-scan (LIDAR) survey instrument in a helicopter for the following reasons:

1. A helicopter is a more stable platform in unstable air.
2. A helicopter is more flexible when maneuvering to make certain that the entire target area is sufficiently covered by the laser's scanning beam. Often it is necessary to fly the helicopter sideways or even backward to ensure that sufficient data is captured without leaving "holes" in the resulting data.
3. A helicopter can fly lower and slower than a fixed-wing aircraft can, thus providing a more accurate and more uniformly dense laser "dot" pattern, much more dense (when required) than can be acquired from a fixed-wing aircraft.
4. A helicopter can make "flat" turns along right-of-way (path) targets and stay on target while a fixed-wing aircraft would have to "skid" around or even miss tight turns entirely. This provides for far less flight time for the helicopter to cover the same path as opposed to the wide-turning fixed-wing aircraft. Additionally, when making turns, the fixed-wing aircraft often banks too steeply and loses the GPS satellite signals; and this requires the fixed-wing aircraft to "start over".

Almost as soon as Aerotec's LIDAR data is captured, the development of three-dimensional digital terrain and facility models and can begin (before ground control can be acquired and traditional film-based aerial photography can be captured, before the required analytic triangulation can be performed, and before traditional film-based aerial photography can be processed). Traditional analytic triangulation associated with traditional film-based aerial photography is not required at all when LIDAR data is used. Aerotec's proprietary LIDAR data filtering/classification software ensures that "bare earth" data is available for the construction of accurate digital terrain models. Aerotec's LIDAR has been shown to accelerate project schedules cost-effectively in several different industry groups.

Aerotec has integrated high-resolution color digital imagery (digital aerial photography) with its LIDAR topographic and facilities geometry data to produce comprehensive 3D models for electric power transmission (routing, rating, upgrade, re-stringing, rebuild), plant site, highway, railroad, airport, waterway, open-pit mining, and other engineering applications. Agriculture, forestry, and special military mapping and modeling products have also been produced. Considering electric power transmission line engineering applications alone, Aerotec has modeled over 8,000 miles of new and existing right-of-way in the past couple of years. Aerotec's mapping and modeling work has been done in remote, rural, urban, municipal, military and environmentally sensitive areas even when ground access has been limited or even prohibited. And, all of Aerotec's model data is compatible with all types of geographical information systems (GIS).

On request, Aerotec augments its LIDAR and digital imagery mapping and modeling products with full-motion color video, infrared, corona, multi-spectral, and/or hyperspectral imagery technology products. Aerotec removes the technology risks from its customers' mapping and modeling projects. ●

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NxtPhase Introduces TESLA Portable Disturbance Fault Recorder

NxtPhase has introduced a new portable disturbance fault recorder, ideal for simultaneous, multi-functional recording in a compact, rugged enclosure. Suitable for substation or industrial environments, TESLA Portable is based on the proven technology of the NxtPhase TESLA recorder. Fault, disturbance, trend, event and fault location information is available in a single powerful platform. Users can quickly capture and analyze everything from system faults and motor start-ups to long-term effects such as line power factor. Each recorder has 18 analog (and 32 digital) input channels with capability to create many other virtual quantities from

these inputs. Data can be locally analyzed or can be sent by high-speed transfer to a Master station (via modem or Ethernet).

As a diagnostic tool for power system engineers, the TESLA Portable recorder may be employed at critical points in the system to analyze power flow and improve overall system performance. The TESLA Portable's user interface makes installation easy and safe, ideal for users who operate equipment infrequently or for system emergencies that require rapid response.

NxtPhase Corporation provides digital and fiber optic solutions that will change the way high-voltage electric power is managed in a competitive electric power industry. Optical sensing products offer more accurate digital information, broader dynamic range, wider bandwidth, improved safety, and environmental benefits compared with conventional technologies. The NxtPhase relay and recorder line provides smart, easy-to-use protection and monitoring of electrical power systems. Future development will enhance the ability to use data interactively across the electric power grid. ●

Find out more about innovative NxtPhase solutions at www.nxtphase.com.

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Gradient risk assessment for poles
Risk Assessment of CCA-Treated Utility Poles Completed

A new human health risk assessment, conducted by a respected environmental consulting firm, offers important information to confirm that CCA-treated wood continues to be suitable for use in utility poles. The assessment found that "…the amount of arsenic complex potentially taken into the body from exposures to CCA-treated utility poles… is at least 14-times less than the intake of naturally occurring inorganic arsenic in food or drinking tap water at the new federal drinking water standard…"

The report, "Assessment of Potential Health Risks from Exposures to Arsenic Complex Associated with CCA-Treated Utility Poles," was conducted by Dr. Barbara D. Beck and Eric M. Dube of Gradient

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Corporation, Cambridge, Mass. It looked particularly at risks to utility workers and to children who might play near poles.

In the assessment's Summary of Key Results, the authors write, "To our knowledge, there are no documented cases of adverse health effects associated with exposures to CCA-treated utility poles for workers or for nearby residents… The results of the risk assessment indicate that potential health risks to workers and residents do not exceed the U. S. Environmental Protection Agency's acceptable risk limits."

The utility pole health risk assessment was commissioned by Arch Wood Protection, a developer and manufacturer of wood preservatives. ●

Copies are available at:
www.wolmanizedwood.com/gradientpole.html and from Arch Wood Protection

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A solution for the quality control of aluminothermic welded joints.

Ndb Technologie announces the release of a new product, the AL-40. This instrument is used for the quality control of aluminothermic welded joints by measuring the electrical resistance. It's an innovation because the traditional method to check aluminothermic weldings used to be a visual inspection. This method is now considered ineffective because a lot of factors escape this type of control: conductor oxydation, insufficient preheating temperature or traces of humidity can all result in a solid, good looking welding which resistance value is still too high. Ndb has the safest and most accurate non-destructive method for this type of joint.

Ndb Technologie conceived and developed the AL-40 to satisfy a need in the industry. In fact, the quality of energy and grounding network joints is of prime importance for the companies who produce or use high power electric energy (power plants, substations, railways, aluminium foundries, etc). A bad quality joint overheats and provocates a decay of the network, that soon translates into long and costly maintenance. Measuring the resistance value of such weldings with the AL-40 enables you to make the difference.

NDB has acquired a solid expertise in various fields such as electricity and control. Electrical applications include: cable location, phase identification and GPS-synchronized long-distance phasing. NDB's expertise in the area of measurement involves micro-resistance measuring, partial discharge detection and fault location. Also, through the years, the team developed an expertise in field application instruments, especially for handheld devices used in harsh environments. In fact, this expertise has in turn enabled the company to access the most demanding markets in terms of standardization. ●

For more information visit www.ndb.qc.ca.

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ArcFM/ArcGIS - Preferred GIS Solution for Canadian Utilities

The business of providing electrical, gas, telecommunications, water, and sewer services in Canada is undergoing its greatest change ever. Deregulation, privatization, and municipal amalgamation are putting tremendous pressures on the agencies that sell and deliver these services. Today's utilities must transform themselves into competitive, efficient, and cost conscious businesses.

One of the key components of this transformation is information. Asset and customer information is vital to utilities and as a result must be accessible and accurate. Information technology, especially geographic information systems (GIS), is playing a strategic role in helping utilities manage and use this information more efficiently.

In their efforts to improve efficiency and productivity, several Canadian utilities have elected to implement ESRI's ArcGIS software along with Miner & Miner's (M&M) ArcFM solution to assist them in effectively managing their spatial information.

The ArcFM™ Solution is a complete set of GIS utility applications for modeling, editing, maintaining, and managing facility asset data in an enterprise system. The ArcFM Solution offers proven software tools and strategic opportunities to use GIS throughout the utility organization.

For the City of Medicine Hat Electric Utility (CMHEU), in Alberta, Canada, POWER Engineers is providing migration services from Medicine Hat's legacy system into M&M's ArcFM. Medicine Hat is located in southeastern Alberta near the Saskatchewan border. The utility operates two natural gas generation plants, 873 miles of distribution, and 77 miles of transmission, delivering electricity to all customers within the City of Medicine Hat, Redcliff, Dunmore, Veinerville, and outlying rural areas adjacent to the City.

Thunder Bay Hydro is a private local distribution company owned by the City of Thunder Bay. It has a metro population of more than 120,000 and services a regional area with a population of more than 260,000. The City incorporates GIS technology into a wide range of municipal services.

The utility is implementing ArcFM to allow personnel to digitally update the facility database providing improved data currency and eliminating the need for paper storage.

The New Brunswick Power Corporation (NB Power) is the largest electric utility in Atlantic Canada. NB Power operates one of North America's most diverse generating system and interconnected transmission network. It delivers electricity to over 340,000 wholesale, industrial, commercial, and residential customers.

NB Power selected the ArcGIS/ArcFM technology to be used as the primary engineering database holding all infrastructure/network data including distribution substations, distribution transformers, poles, and lines. The data will then be used to build a network model to be used by the outage management system (OMS). The GIS and the OMS work together to link customer information to the control room assisting in the deployment of crews and resources.

The Power Commission of the City of Saint John (Saint John Energy) is a municipal electric utility that has been serving the City since 1922. The focus of the utility has been the efficient delivery of electricity to local consumers. As a non-generating utility, its main responsibility is the distribution of electricity and customer service for approximately 35,000 customers.

Saint John Energy selected ESRI's ArcGIS software and M&M's ArcFM Solution including Designer and Network Adapter as their enterprise GIS, and ESRI Canada to implement and support the GIS. The GIS is a part of Saint John Energy's overall Integrated Enterprise Application which also includes: Management Information System (MIS) and a Customer Information System (CIS).

The City of Saskatoon operates an electric utility providing electrical service to the area of Saskatoon. GIS in the City had been highly decentralized with each department maintaining their own data sets. A GIS Management Committee decided to implement an enterprise GIS to facilitate data sharing across departments and to eliminate data redundancy. The City of Saskatoon chose ESRI and M&M's technology for the implementation of the Enterprise GIS.

"I am extremely excited that many clients in the utility industry are moving to the ArcGIS platform," said Alex Miller, President, ESRI Canada. "ArcGIS is

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ideal for the utility environment as the data structure, the geodatabase, has the ability to customize feature types for modeling real world behavior. ArcFM provides utility users with productivity tools that support the way the industry uses and manages data in the modern competitive marketplace. By combining ESRI and Miner & Miner technology and services, electric, gas, water, and wastewater utilities can increase productivity, lower costs, and improve services by effectively managing their spatial information."

"The growing Canadian user community is evidence of M&M's well matured ArcFM software solution coupled with ESRI Canada's extensive experience," said Paul Snook, M&M's VP of Sales and Marketing. "We are delighted to further expand our ability to serve clients and potential customers with our state-of-the-art technology to help increase utilities operations' efficiency and benefit their bottom line." ●

For more information, please visit www.miner.com or www.esricanada.com.

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Datamatic Renews Focus on Energy Sector

Datamatic (www.datamatic.com) has provided AMR solutions to municipal and investor-owned water, gas and electric utilities for the past quarter century. Skyrocketing demand for the integration of electronic meter reading and advanced automatic meter reading technologies in the energy sector led the company to create an Energy Systems business unit in Q4 of 2002.

According to Datamatic CEO Ken Kercher, "We created this group to focus on the unique needs of the energy sector where reliability, service, monitoring and control of power usage are critical. Datamatic is aggressively pursuing new strategic partnerships and integrating technologies that create value for our clients."

The Energy Systems group recently announced the release of the FIREFLYTWO power reporting module for electric and gas meters. The FIREFLYTWO includes the features of the successful first-generation FIREFLY and adds wireless programming and ProfilePLUS™ Load Profile extraction via RF. The result is that demand and profile data is collected, analyzed and monitored in real time, with alarms and status information available through the radio.

Another important development has been the forging of a strategic relationship with SchlumbergerSema to jointly develop and market Fixed Point AMR technologies.

"Our mission is to continually expand products and services to meet the needs of energy providers," said Datamatic Energy Systems Business Development Director, Mike Caranfa. "This relationship will permit customers to take advantage of hundreds of existing SchlumbergerSema control, information and telemetry systems already deployed across the country."

"The sector's strategies of customer retention, quality care and lower costs are the drivers for our products and services," stated Datamatic Sales and Marketing VP Scott Durham. "Many new customers are already using our latest generation RouteSTAR MVP" route management and ROADRUNNER X7 hand held system in anticipation of their migration to the FIREFLYTWO. We believe the market is hungry for our proven solutions." ●

Circle **115** on Reader Service Card

GeoSpatial Innovations, Inc.

GeoSpatial Innovations, Inc. (GSI) is pleased to announce the release of GSI Pocket Collector, an asset inventory and network management solution for energy companies, at this year's GITA conference in San Antonio. Pocket Collector runs on a Windows CE device and utilizes Global Positioning System (GPS) technology to quickly capture asset attribute and network data in the field. The data collected in the field is then automatically synchronized to the field engineer's office computer system, and easily exported into any number of desktop programs such as Geographical Information System (GIS).

Pocket Collector is a powerful follow-up product to GSI Pocket Designer for mobile job design. The look and functionality of Pocket Collector is similar to Pocket Designer, with customizable attribute data configured to the user's needs. These intuitive products increase mobility, enhance job quality, and decrease cost. GSI offers Pocket Collector and Pocket Designer separately or together in a bundle with a variety of hardware options.

GSI is a licensed business partner with Trimble, an industry leader in GPS technology. Pocket Collector and Pocket Designer can be installed on the Trimble GeoXT, a GPS integrated, rugged, hand-held PC. The GeoXT provides sub-meter location accuracy, eliminating the need for measuring tapes or wheels, or manual note-taking. GSI supports several other mobile and GPS hardware configurations, depending upon functional and pricing requirements.

GSI is a software development firm that offers energy distribution companies a suite of out-of-the-box mobile solutions for network design and management. GSI's tools utilize Global Positioning System (GPS) technology from industry leader Trimble to quickly collect and manage data in the field. And GSI has developed partnerships with key vendors to provide seamless interfaces from its tools to GIS, work management, and job design systems. ●

For more information visit: www.gsiworks.com.

Contact: Dan Shriver at: dshrive@gsiworks.com

Circle **116** on Reader Service Card

The Manitoba HVDC Research Centre

The Manitoba HVDC Research Centre, a research arm of Manitoba Hydro, is please to announce the general availability of the PSCAD Version 4 Power System Simulation software. PSCADTM (Power Systems Computer-Aided Design) is used by utilities, electrical equipment manufacturers, engineering consultants, and research organizations in 60 countries around the world to design and simulate all types of power systems including power electronics and controls. Reducing the learning curve and making PSCAD easy to use was a primary consideration in the design of V4. This is in recognition that engineers and technologists should view simulation and modeling software as a facilitator and not require the development of specialized expertise in the use a particular software simulation tool. While adding more power to PSCAD, it was important that simulation model development time be reduced and and the application execution speed be enhanced. PSCAD Version 4 comes with a new windowing and drawing Interface, advanced plotting tools, enhanced on-line controls, a data management interface, a MATLAB/Simulink interface, and a selection of new electrical models. ●

For more detailed information on the new PSCAD Version 4 or for an evaluation copy, please visit www.pscad.com or email pscadv4@pscad.com

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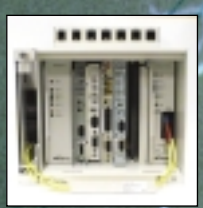

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By:
J. E. (Jim) Koop
W.I.R.E. Services/
Manitoba Hydro

Upgrading Transmission Lines with Aerial LiDAR Technology

A SaskPower case study using helicopter surveys to collect data for line modeling

In today's changing utility environment, one thing remains constant - electric utilities are continually looking for better ways to increase transmission capacity to satisfy the ever-growing demand for power. In the "distant past", utilities were able to construct new transmission lines whenever load growth determined the need. Today, utilities don't have that option due to environmental and property considerations and are challenged to find innovative ways to increase capacity with their existing plant, all within tight budget constraints.

To the transmission line design engineer trying to increase line capacity, knowing exactly what is in the field is essential before re-designing. Often however, important information including thermal temperature constraints, minimum ground clearance, structural loads and wire sag and tension is not accurately recorded on existing plan and profile drawings. In general, the plan and profile drawing is a record of how the line was designed, not necessarily how the line was built. Use of these drawings as a base for future upgrades, therefore, means it is likely that inaccuracies will be transferred forward to the new design. The possibility that no information whatsoever is available on a particular line also exists. In such situations, what option is left to the engineer?

This was exactly the situation faced by Manitoba Hydro when, due to expanding power sales, a small portion of the utility's 115 kV transmission system became overloaded. The need for upgrading was clear, but, since much of this system was built between 1914 and 1931, plan and profile drawings were either severely outdated or non-existent. To meet the need for a new survey that would provide both terrain information and accurate sag and tension data on every span along the line, Manitoba Hydro selected to use LiDAR (Light Detection and Ranging) technology. LiDAR was chosen for two important reasons – firstly, the need to upgrade was urgent and the LiDAR data collection method offered very fast turn-around time from collection to delivery. Secondly, and most importantly, LiDAR offers the highly accurate ability to map terrain and wire catenary shape in every span.

"When we took delivery of the first complete line data set, we began to analyze it using standard transmission line design modeling software. It was a real awakening" says Jim Koop, General Manager of Manitoba Hydro's Worldwide Integrated Rating Enhancement (W.I.R.E.) Services division. "The information available for us to analyze the existing line condition didn't just improve our ability to accurately find problems, it also allowed us to use other innovative approaches to line upgrades."

One of those innovative approaches to upgrading was a wire re-tensioning technique called "Nip&Tuck"™ (N&T). This software, developed by Itron (formerly LineSoft), is essentially a "multi-span analysis" program commonly used by transmission line engineers to determine the effects of unbalanced loads on transmission lines. N&T creates a computer model of the transmission line wire based on the LiDAR data and models its behavior under high temperature operation. It then identifies clearance violations that are eliminated by two methods. The first is a "Nip", which refers to the removal of a small segment of wire. The second is a "Tuck", which slides the conductor support clamp forward or backward along the wire. These operations can be done individually or together on any span requiring additional clearance.

On the first of several lines Manitoba Hydro applied the N&T process, design engineers increased the line's thermal rating from 56°C (52 MW) to 100°C (115 MW). Not only did this process provide for a capacity increase of 121%, this increase was achieved with a saving of 70% over conventional re-tensioning techniques. Since then, Manitoba Hydro has collected LiDAR data on approximately 2000 kilometers of 115 kV and 230 kV transmission line and has successfully used N&T upgrade techniques on over 160 km of line.

One of the direct spin-offs of Manitoba Hydro's extensive experience with LiDAR technology was the creation of their W.I.R.E. Services division in July 2001. Through an exclusive partnership with LiDAR Services International (LSI) of Calgary, Canada who provides the data collection services, Manitoba Hydro is able to offer quality LiDAR data collection and engineering analysis to electrical utilities that want to use new technology methods, but can't, due to manpower or other constraints.

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In the fall of 2001, SaskPower, the electric utility serving the province of Saskatchewan, Canada contracted W.I.R.E. Services to provide a capacity analysis on its 138 kV transmission line between Saskatoon and North Battleford (Q1N/Q2N). The 135 kilometer long, double circuit steel tower line was built in 1961, traversing prairie farmland in central region of the province. The line had experienced numerous catastrophic failures due to extreme weather events during its 40 years in service. Over the years SaskPower had undertaken several mitigative measures, including the addition of 6 wood pole dead end structures designed to minimize cascading failures.

During the previous year, SaskPower transmission design engineers conducted a ground clearance study based on the original plan & profile drawings from 1961. The main obstacle that prevented a precise analysis was several tension changes that had occurred over the wire's life. However, the study revealed that at least two of the four lowest 477 MCM Hawk conductors were subject to experience clearance problems at operating temperatures around 20°C. "Given the clearance problems we could experience, we knew what we needed was a survey that would provide us with all the data we required for a proper analysis." said Don Nagel, SaskPower's Senior Transmission Engineer.

Work on the survey started when LSI mobilized their Helix LiDAR system to North Battleford in October 2001. In the space of 4 hours and 45 minutes, via a 135-km return flight from North Battleford to Saskatoon, LSI used onboard sensors to capture above ground LiDAR data and digital video imagery of the transmission line. Simultaneously, ground crews monitored weather stations, capturing temperature and wind data essential for determining base case wire temperatures.

Following the flight, with well over 26 million points collected, the dense LiDAR data was filtered to create a manageable DTM (digital terrain model). Each point in the DTM was assigned a feature code to define its particular attribute, such as bare earth point, low vegetation, structure, wire, etc. In addition, every point representing an overhead wire hit in every span was stripped out and a catenary shape determined for the sag and tension analysis. Another added feature provided was the creation of orthorectified digital images of the entire right of way. These full colour images are useful to the design engineer as they offer an aerial perspective view of the line at true scale, and allows measurements from point to point. It is also possible to integrate these images into modeling programs and view the terrain model with an image overlay simulating the true relief of the right of way.

With all this data on hand, the analysis of SaskPower's line was set to begin. Experienced Manitoba Hydro transmission line engineers evaluated each of the four lowest conductors separately, then created individual design models for each. Combining the weather data along with line current, the wire temperature was established for the high temperature simulation. Evaluation of the minimum clearance in each span was carried out for a base case temperature of 9°C. No clearance violations were expected and none were found. This process was repeated for temperatures from 20°C through to 100°C in 10 degree increments and the number of clearance problems determined and graphed. It was confirmed that the maximum operating temperature of these two circuits was below the operating limit set by system control and SaskPower quickly requested W.I.R.E. Services to develop a Nip&Tuck solution.

One of the first steps was to establish loading criteria for this 40-year-old steel structure line. SaskPower imposed stringent longitudinal imbalance limits on the structure arms because of the narrow base dimension and past failure history. Maximum tension limits were also set for both very cold (-35°C) temperatures and heavy wind and Ice conditions. Balancing these conditions while increasing ground clearance would prove to be a challenge to Nip&Tuck.

Next, the new upgrade operating temperature was established using a combination of load growth forecasts and a feasibility study of how much sag reduction N&T could reasonably achieve. The end result indicated that 100 MVA, which equated to a 66°C conductor temperature limit, would meet the planning projections for load growth in the Saskatoon area for the next ten years. All that was left was for design engineers to develop a solution that would meet all these constraints.

Since the bottom four conductor models were already available from the rating study, each was loaded into N&T. The 331 transmission line spans multiplied by the four individual wire models combined for a total of 1324 spans. Of these, approximately 26% or 341 spans required sag modifications to meet minimum ground clearance values for a 66°C operating temperature. All remaining spans met minimum clearances and did not need any modification.

It was determined that, in total, 214 conductor nips and 380 clamp shifts would be required to achieve an upgraded operating temperature of 66°C on this line. "One of the most impressive things was the speed at which the N&T solution can be implemented" recounts Don Nagel.

SaskPower hired 3 local contractors and set them to work in specified areas along the line. Each contractor was given a preset rate for each splice installed and for every support clamp adjustment made. With this combined effort, the Nip&Tuck design solution was completed in 14 days.

"One crew could quite easily complete 10 Nip operations in one day, while another came behind and shifted the support clamps" mentions Don. "The whole operation went very quickly, especially since the Nip splice could be installed anywhere in the span. Crews were able to find convenient places to set up which made it go faster."

Another highly impressive result of this project was the cost saving realized by using the Nip&Tuck solution. The original cost estimates for the project using conventional techniques were determined to be more than $1.25 million. The Nip & Tuck technology, SaskPower saved more than 80% with actual costs in the neighborhood of $232,000.

SaskPower put the North Battleford/ Saskatoon circuits back into service on May 30, 2001, a mere 36 days after the request was sent to engineer a Nip&Tuck solution. "We're very pleased with W.I.R.E. Services. They've got an exceptional ability to provide quality-engineering services for upgrading transmission lines. They bring a truly unique utility perspective to the project and don't just leave you with piles of data" says Don Nagel. "Best of all, after analyzing the line rating, they were able to provide us with a real workable and very affordable solution".

SaskPower was also interested in considering further upgrade options for load growth forecasts beyond 10 years. In response, a 100°C operating solution was provided. The design solution required 206 structure extensions, to raise support heights, along with an additional 208 Nip and 231 Tuck operations. SaskPower now has the advantage of knowing what is involved to upgrade to 100°C and can accurately forecast the cost when the time comes.

Manitoba Hydro is also committed to the use of LiDAR surveys for upgrade data acquisition. They are currently in the 3rd year of an 8-year program to accurately map approximately 40% of their transmission system. During this winter season Manitoba Hydro construction crews will complete over 160 km of N&T upgrade solutions to two 115 kV transmission lines.

According to Jim Koop, Manitoba Hydro is committed to becoming a leader in upgrade technology. And he adds they are also committed to bringing that technology and its many benefits to other utilities. ■

About the Author

J. E. (Jim) Koop is the General Manager of W.I.R.E. Services, a division of Manitoba Hydro located in Winnipeg Canada. Mr. Koop graduated from Civil Engineering Technology in 1982 from Red River College in Winnipeg, Manitoba. He is a registered Engineering Technologist in Manitoba as well as a member of IEEE, Power Engineering Society. Mr. Koop has over 18 years experience in Transmission Line Design at Manitoba Hydro. He was responsible for major transmission line projects from conceptual design planning through to construction. His interest in LiDAR technology began in 1998 when he developed and coordinated a program to verify existing line ratings through the use of LiDAR technology. The program's success led to the formation of a business relationship with LiDAR Services International and the creation of W.I.R.E. Services. He can be reached at jekoop@wireservices.ca.

By:
Randell B. Hirschmann
Oberon Company
Div. Paramount Corp

Principles of Arc Flash Protection

Complying with the Electrical Safety Standards

There have been several recent developments in the standards of Electrical Safety. These standards cover virtually every electrical worker in the US and Canada. The goal of these standards is to provide for a safer work environment. Across the industry, arc explosions occur daily (perhaps even as frequent as 1 every 8 hours in the USA alone according to some statistics).

Unfortunately, for every one of these arc explosions, there is a tragic story of disabilities, families broken by divorce and even lives lost. From the perspective of an employer, this is not a hypothetical issue, but one that is likely to severely hit your bank account in the form of medical, rehabilitation and training costs as well as substantial OSHA fines.

There are 7 simple ideas to keep in mind when developing your arc flash protective program.

#1 **The Worker:** The worker himself is a critical component of a company's electrical safety program. The electrician himself should be qualified to do the work he/she is being asked to perform. The NFPA 70E requires that the worker possess enough knowledge and training to perform the task (NFPA 70E-2000 2-1.1.2). "A Little Knowledge is a Dangerous Thing". This could not be more true. If the task is beyond the capabilities of someone, he will be putting his life, the lives of his coworkers around him and a value of a very expensive piece of electrical equipment in jeopardy.

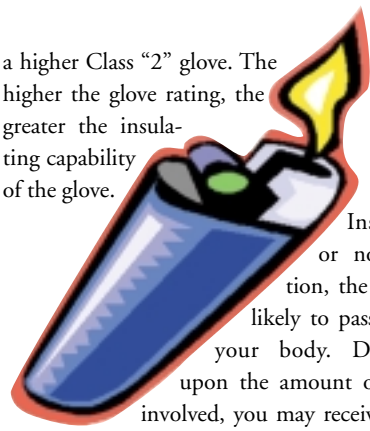
#2 **Work Practices:** As an employer, you do not want to put your people in harms way. It is desirable to minimize any potential hazard to which your people may be exposed. You must develop a set of work practices, or rules, by which you require your electricians to work. Examples would include:

① Working de-energized
② Use of equipment such as grounding clips and hot sticks
③ Lock out – tag out programs, etc

#3 **Hazard Assessment:** The NFPA 70E-2000 requires every employer of electrical workers to perform a hazard assessment of any task over 50Volts to be performed where there is the potential of an arc flash incident (NFPA 70E-2000 Section 2-1.3.3). The purpose of this assessment is to determine the level of hazard to which the employee will be exposed while performing the task. As a result of this assessment, the employer will be able to provide suitable rated PPE. The hazard assessment begins with the collection of data about the task and the energy available at that site. This would include:

① Bolted Fault Current
② Voltage
③ Arc Gap
④ Distance from the worker to the Arc Source
⑤ Arc Duration based upon upstream breakers, disconnects etc.
⑥ Arc in a Box (Arc within an enclosed space)

With the Voltage known, it is easy to identify the suitable glove for the work to be performed. The rubber gloves act as an insulation from electric shock (and potential electrocution). They need to have sufficient insulation to resist the conduction of electricity from the source, through your body to ground. If you are working on a system with supply voltage of 480 volts (AC), a simple Class "00" glove will be sufficient. However, if you are working on a system with approximately 17kV (AC), you will be looking at a higher Class "2" glove. The higher the glove rating, the greater the insulating capability of the glove.



Insufficient or no protection, the energy is likely to pass through your body. Depending upon the amount of current involved, you may receive a small jolt, a substantial burn or even death by electrocution.

Identifying the suitable level of clothing is a little more involved. The gloves you wear are insulation from shock. The clothing you wear is insulation from heat, the thermal energy generated by this terrific explosive release of energy created by the arc. This energy is measured in Calories, or more specifically, calories per square centimeter. To visualize this, consider a cigarette lighter. Your fingertip is approximately 1 square centimeter (cm^2). Hold the cigarette lighter about 1 inch under your fingertip. Now light it. You will not be able to hold it there for long. In 1 second, your finger received approximately 1 calorie/cm^2. If you cannot hold you finger for such a short duration when exposed to 1 calorie, imagine 8 calories, or 40 calories or even 95 calories. An arc explosion, and its thermal energy should not be taken lightly. Even 2 or 3 calories, a level easily attainable by a 480 volt service, should be treated with respect.

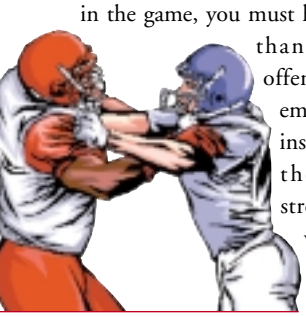
The amount of current available, or the Bolted Fault Current, is a major variable determining the amount of thermal energy produced by the arc explosion. If you are not generating your power on site, contact the engineering department of the local utility (the utility providing the electricity to the site upon which you will be working), and inquire about the current available to the facility. A simple analogy that illustrates this point well is your home … In your basement you may have an electrical panel, which is rated to 100 amps. However, running up and down your street are power lines, which are

carrying perhaps 2000 amps of power, to supply not only your house but also the other houses on your street. In the event of an arc incident within your electrical panel, the arc is likely to consume much of the 2000 amps running down your street. It will draw as much power as it can find, releasing it in the form of an arc explosion. The same would occur within your facility. If the local utility is providing the electricity to your facility, potentially all the electricity running down your street could be drawn upon to create the arc. Certainly, equipment, lighting and office equipment would likely lessen the amount of energy available to the arc, yet quantifying the reduction is difficult or impossible. It is often easier to include in your calculations the full Bolted Fault Current, rather than a "guess". This will at worse overestimate your hazard a bit while increasing your margin of safety.

There are several resources available to you to calculate the level of your potential arc energy exposure. One simple tool is the Duke Power Heat Flux Calculator. This is a simple program that will provide a reasonably accurate calculation. It is a Free Shareware that is available on the Internet (www.arcflash.com/heat-flux-calc.htm). Within NFPA 70E, there are formulas to calculate your hazard levels as well as hazard approach boundaries.

When doing your hazard assessment, it is important to keep in mind the famous computer expression, "Garbage in, garbage out". It is important to start your calculation with reasonable numbers. If you put into your calculations unreasonably low numbers, the result will be non-representative of the actual hazards and you will be under protecting your people. It is best to start your assessment with reasonable numbers to insure that you have built in a safety factor for your workers.

#4 Protection Greater than the Hazard: Using a football analogy, to keep your team in the game, you must have a defense stronger than your competitor's offense. To protect your employees, you need to insure that the protection they are wearing is stronger (the clothing with a higher calorie rating) than the arc which could potentially be generated by the work they will perform. Just as you would not want to be wearing a bulletproof vest rated for a B-B gun, then get shot by a shotgun. You will likely be dead because despite wearing the vest, it did not afford you enough protection against the shotgun. Nor would it be desirable to be wearing arc flash protection that is under-rated for the thermal hazard. The result of under protection will be severe burns and potentially death.



#5 Layering: There has been a lot made of the idea of layering your protection. The goal is to add the protection offered by the various layers of garments (including the protection offered by the airspace between the layers), to create a protective system equal to the hazard. Typically, the FR Cotton or Nomex® coveralls used by an employee will provide anywhere from 4 to 11 calories of protection. Add to this a 15 calorie suit and, so the thinking goes, I have around 25 calories of protection. Yes… but no! Yes, the body will have approximately 25 calories of protection by combining the work clothes with the arc suit, but you are not wearing the work clothes on your head. The 15 calorie hood is the only protection for the head, your face is only protected against 15 calories. If the employee is exposed to a 25 calorie arc explosion, his body will be protected, however, his face and head will be severely burned! Modern medicine is wonderful and at times can perform apparent miracles, however, it has its limitation when it comes to repairing ones face after a burn injury.

#6 Surface Area: If it is not covered, it is not protected! Some are tempted to use only a coat or a hood and a coat without pants… unfortunately, not only is this not wise, it is also not in compliance with NFPA 70E. A hazard above 8 calories requires the use of hood, and clothing which covers the entire body. Below this level (Hazard Category 1 and 2), typical FR work clothes and an arc rated faceshield will likely be sufficient for the standard. But regarding faceshields, faceshields are just that, a shield for your face. It is not a head protective devise. It only protects your face (measured by the sensors on the test

mannequin at the two eyes, the mouth and under the chin). You may wish to seriously consider the use of a balaclava sock hood when using a faceshield, at these levels below 8 calories, to provide protection to the remaining of your head. However, above 8 calories, NFPA 70E calls for hoods.

#7 **Clothing:** Not all arc flash protection is equal. NFPA 70E and ASTM F1506 require that every arcflash garment state on the label its arc flash rating. This can take the form of an ATPV (Arc Thermal Performance Value) or EBT (Energy at Break Through). This states that the manufacturer of the garment has performed tests upon the fabric, of which the garment is made, and determined that the fabric provides a specific level of protection against the thermal energy of the arc explosion. An EBTAS is not a valid arc rating for arc clothing. Always check for an arc rating (ATPV or EBT). If the garment does not have an arc rating, it is NOT arc flash protection.

In August 2002, a new standard was released, ASTM F2178. This standard requires the manufacturer of hoods and faceshields to conduct tests on these products. This standard was developed to insure that a hood is rated at the weakest point of the hood. A manufacturer is required to conduct a minimum of 20 test samples of the as sold product. No longer will the hood be rated by the protection offered by the fabric alone, but rated by the performance of the product itself. This is slowly seeping its way into the industry. Contact the manufacturer of your protective devise to determine what testing it has conducted.

Finally, protection not properly worn will not provide the protection necessary. If the coat is unzipped or the hood is sitting on the floor, the user can expect to be burned by the arc's thermal energy, despite all his knowledge and experience, his employers well-intended hazard assessments and the expense of the arc garments.

The job of an electrician is dangerous work. In fact, based up recent US Department of Labor Statistics, electrical workers have chosen the 3rd most dangerous profession. Yet, if an accident were to occur, with proper precautions, care and training in accordance with NFPA 70E, burn injuries resulting from an arc flash explosion can be minimized or even prevented. The effect upon your employee and your company's moral and finances will be better for your efforts.

The ArcTrainer CD-ROM, covering the Electrical Safety Standards and Arc PPE can be ordered FREE over the Internet at www.arcflash.com/ee Copies of the NFPA 70-2000 Standard can be purchased directly from NFPA at the web site www.nfpa.org/catalog ■

About the Author

Randell B Hirschmann, Director of Marketing, Oberon Company div Paramount Corp, which has over 60 years experience in Personal Protective products.

For more information about Arc Flash PPE, Electrical Safety Standards or available Hazard Assessment resources, please contact Randell Hirschmann at RHirschmann@oberoncompany.com or visit the web site at www.arcflash.com

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*Associate membership in NRECA does not signify an endorsement of products or services.

By:
Chris Harlow

What's Next for GIS and Mobile Computing?

A lot has changed since my first involvement with AM/FM/GIS over two decades ago. Some of the changes include:

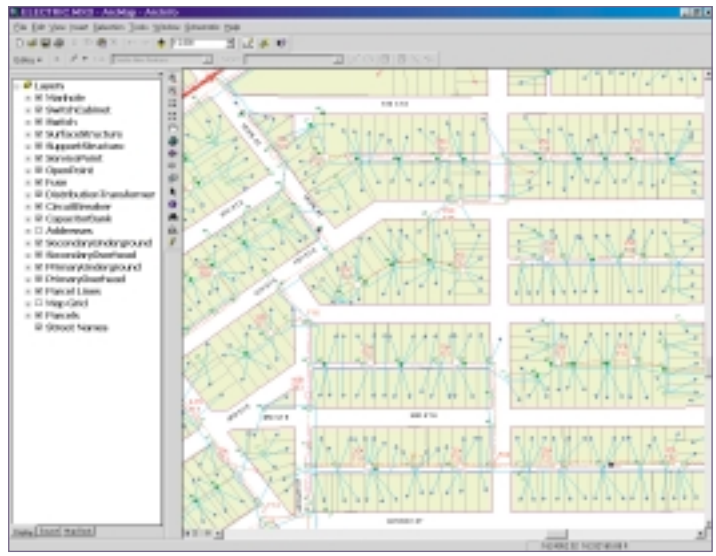
- ☆ Specialized hardware is a thing of the past
- ☆ Arcane interfaces are (almost) gone
- ☆ Computers sit on the desktop or in a shirt pocket, not on the raised floor of an isolated data processing center
- ☆ The Web is here, there, and everywhere
- ☆ Software is finally affordable
- ☆ The folks in the executive suite know about GIS
- ☆ Proprietary databases have given way to commercial software
- ☆ IT directors don't run when they see a user request for AM/FM/GIS
- ☆ The software actually works.

That last change – software actually working – may be the most important aspect of AM/FM/GIS. It today's environment, utility executives and system users cannot afford to waste money on software that does not do the job. Moreover, that software must improve the business process, or it might as well stay on the shelf. In fact, among major electric utilities in North America, GIS is an accepted technology. While not yet an operational necessity, it is slowly becoming a core technology upon which other applications are based.

Since 1968 utilities have struggled to develop automated technology that allows them to manage their overhead and underground facilities. The requirement was not just to inventory the items, but to build an intelligent graphical and relational database that could keep track of the items, and be intelligent enough to understand their spatial or location relationships. Beginning in the late 1990s major electric utility companies were nearing completion of the massive conversion process from paper to computer, and could turn their attention to driving critical engineering and business applications with the new technology.

If you are not familiar with AM/FM/GIS technology, it includes all applications that rely on a spatial database – one that associates an event or asset with a location. While the traditional primary users are found in distribution engineering, new applications are now used by customer service, marketing, transmission planning, and a growing number of other departments. The market research firm InfoNetrix (www.infonetrix.com) refers to this market as GIS and Mobile Computing Solutions, or GMCS. I've grown to like the term because it encompasses all the spatial solutions that an electric utility might implement. So if most or all of the major utilities already have their GMC solutions installed, does this mean that the end is near for the growth of the technology? Hardly.

While most major electric utilities have functional systems, there are still many smaller companies that are just now realizing the benefits. Mergers and acquisitions, especially in the U.S., force IT evaluations that often result in a change in system technology. But looking at the forecast for GMCS technology does not tell the whole story. GMCS is just one small, yet important part of a utility's overall operations strategy. Industry-wide confusion and uncertainty are by far the most pervasive factors impacting the GMCS marketplace today.



Using AM/FM/GIS to map services Screen shot courtesy of ESRI.

Beginning in 2000, an especially unsettling series of false starts and miscues contributed to a decline in spending between 2001 and 2002 for systems used by systems and distribution engineers, including GMCS. The California power crisis, the bankruptcy of PG&E and the collapse of Enron, as well as other widely publicized irregularities among prominent electric utilities punctuated these events. Although the prevailing climate of uncertainty was exacerbated by the 9/11 terrorist attacks, the reluctance of utilities to move forward with infrastructure investments in North America had already begun to take a toll before then.

Absent any clear and consistent indications of how deregulation will ultimately affect them, large investor-owned utilities remain understandably reluctant to invest heavily in what is so far the uncertain future of a competitive, restructured marketplace. However, the need to invest has never been more pronounced than it is now. Many utilities have already delayed investing in their T&D infrastructure for well over two decades following the traditional investment model of large utilities by directing most of their capital spending to generation as the principal strategy for keeping up with load growth. Today, however, the problem has shifted from constrained generation capacity to one of inadequate transmission facilities to deliver power when and where it is needed.

While utility generation and transmission problems may at first seem unrelated to information technology such as GMCS, they require substantial funding, and for some, that is a scarce commodity these days. The absence of any "quick fix" to the congestion problem through traditional methods for increasing capacity suggests that this transmission crisis will likely translate into a long-term driver for increased transmission and distribution systems expenditures in the years ahead. The good news (and the bad news for conversion companies) is that the biggest investment component of

GMCS — the conversion of data — is nearly complete. Thus, GMCS-enabled utilities are now in position to develop productivity enhancing applications on top of their GMCS systems. This is most reflected in the surge of web-enabled applications for enterprise-wide access to GMCS data as well as in the high level of interest shown in mobile computing as a means to field crews improve their productivity.

Three Road Signs for the Future

In the course of conducting the GMCS market research for InfoNetrix, we were able to identify Seven Signs of GMCS Market Evolution. What follows is a discussion of just three of those signs – indicators of what's next. They are:

1. Technology, Integration & Standardization
2. Data Integrity & System Security
3. Web & Wireless Solutions

Technology, Integration & Standardization

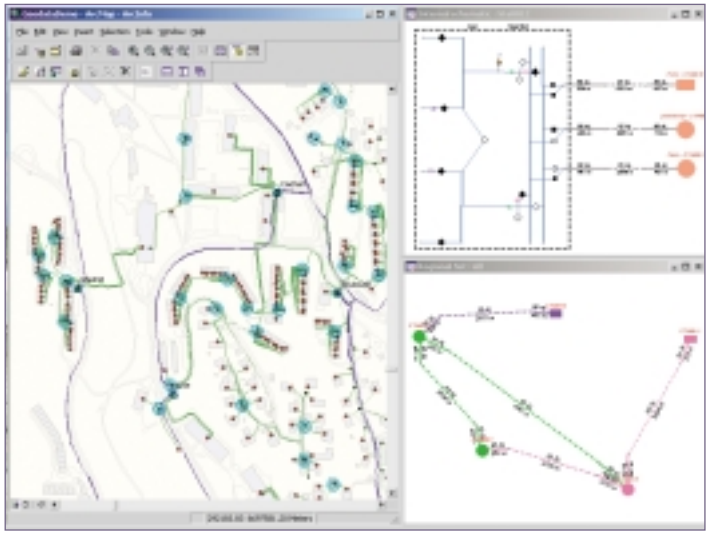
In the early days of GMCS the applications outpaced the technology. Finding graphics terminals and processors for under $50,000 per seat was unheard of. By the mid 1980s mini-computers moved onto the scene, but the application requirements still outpaced the technology. With the exception of Intergraph, (and the now defunct Prime Computer Corporation), hardware technologists did not pay much attention to this market. It wasn't until the 1990s when Intergraph led the way to running GIS applications on Intel Processors and Microsoft's Windows operating system that technology began to catch up. What really happened is that GIS moved from needing special hardware to using a standard desktop PC. At that point, the GIS industry began to benefit from the rest of the IT community's almost insatiable appetite for increasing levels of raw computing power. Finally, we did not have to wait for a GIS-specific workstation to be developed. GIS rode the wave of increasing PC power with a decreasing cost.

The accelerating pace of technology is having – and will continue to have – an especially significant impact on GMCS for the foreseeable future. Continued erosion of average selling prices and the proliferation of ever-larger volumes of products and systems involving similar or even identical base functions and features are among the most evident impacts of rapidly advancing technology on both the AM/FM/GIS and Mobile Computing fronts. For example, users increasingly expect systems to be compatible with Microsoft Windows operating systems at both the desktop and server levels and expect their core GIS software to be Web-enabled. Standards are also beginning to play a central role in the migration of AM/FM/GIS platforms.

In the mobile computing area, the introduction of Microsoft Windows/CE facilitated a faster migration of GIS-enabled technology for handheld devices than any standard would have likely produced in the same short time frame. Fortunately for the electric utility industry, mobile computing products are driven by a huge commercial and consumer market. Furthermore, until recently, relatively few executives knew of or understood AM/FM/GIS. Not so with mobile computing. Today laptops, cell phones and PDA's have replaced the executive attaché case of the 1970s, bringing executive into the market mainstream.

Moreover electric utilities are beginning to look more carefully at I/T expenditures as long-term investments. The supplier experience, however, suggests that while return-on-investment (ROI) is often mentioned as a key criterion for justification and procurement, it is not clear that ROI is ever actually measured after the fact. *"Utilities don't have the staff to even evaluate or try many of the new concepts that could save time and money and boost efficiency,"* said one industry observer who contributed to the InfoNetrix study. Savvy GMCS suppliers understand that new solutions must have an affect on productivity.

As Roxanne Cox-Drake, Electric and Gas Utilities Industry Manager for ESRI told me, "Building on their foundation of asset information systems, utilities extend geospatial capabilities across the company, like supporting integration of schematics for system operators or routing for meter readers. Utilities also get the information to users in the field to support operational efficiency, safety and customer service."



Integrating maps with schematics. Screen shot courtesy of ESRI.

This end-goal of enterprise applications interoperability is intended to improve decision-making through access to increasing amounts of better and more timely data. This is particularly true for mobile computing where field workers can improve their own productivity, as well as back office productivity, by capturing data in field.

There is a clear convergence of technology developing. For example, Outage Management and Work Order Management systems developers recognized that the electronic network developed as part of the AM/FM/GIS project is the perfect starting point for their systems. They also recognized that their customers want these new systems and believe that they, not an outside firm, should be developing and installing the system. The user expects whoever installs the AM/FM/GIS system to understand how the system works and to have a high level of expertise in the vertical application(s). These new applications provide a significant revenue source, and the AM/FM/GIS suppliers are clearly aware of this developing opportunity.

Data Integrity & System Security

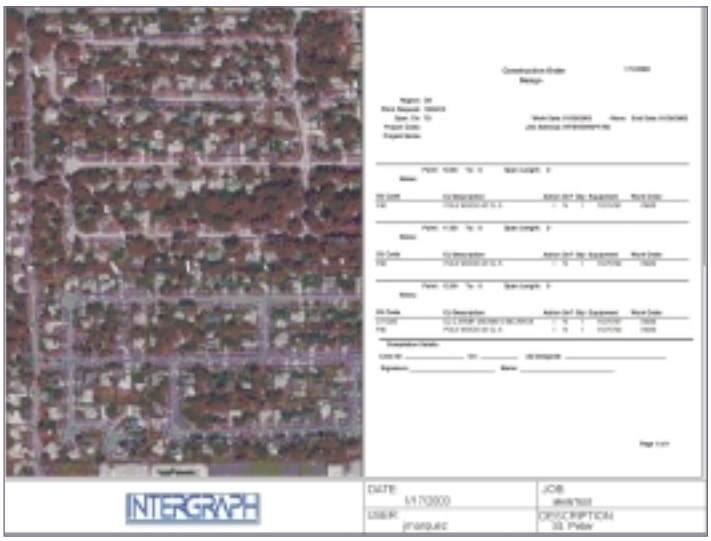
Data integrity is quickly migrating from a general consideration to an implicit expectation. That is, end-users may not express the need for data integrity because they now expect the supplier to have built-in safeguards for their data as part of the baseline offering. With increasing acceptance of commercial-off-the-shelf relational database systems and general maturity of the applications, these expectations are gradually being met by the vast majority of suppliers.

Security, however, raises different questions. Clearly, the War on Terrorism plays a big part in the heightened awareness of security. Yet while most of the public emphasis seems to be focused on the physical security of the utility assets and infrastructure, the data security issues are equally important. In the GMCS marketplace a dichotomy has developed: On one hand, users realize that they must protect the sensitive data that describes the physical assets of the utility. At the same time, however, there is rapidly growing interest in Web and wireless solutions –- two highly vulnerable penetration points for cyber-attacks and other invasive threats.

The cost and proper implementation of security is not widely understood by utilities, nor for that matter by most other companies. Physical security is widely understood, and the measures to secure a facility are well known. However, things change dramatically when it comes to data,. Short of locking the computer in a vault with no outside contact, data is vulnerable to cyber-attacks. These attacks are silent and often go undetected. Securing against them often means increased inconveniences to the end users – mandatory password changes, multiple logon pages, and restricted access to data – to name a few examples.

Least safe are mobile systems. While encryption helps protect the message, it is the mobile network itself that may provide access to the entire enterprise database.

Adding to the misery of it all is the fact that new vulnerabilities in computer networks are being found daily. The points of attack often come through Microsoft products because they are so wide spread and give the cyber attacker a larger target. Thus, as GMCS adopts off the shelf technology, everyone becomes more vulnerable.



Web & Wireless Solutions

The World Wide Web is not unique to the electric utility nor to GMCS. On the contrary, it is everywhere, and we increasingly expect to find just about anything we might want or need to do accessible through a browser interface. The Web has taught corporate users certain things about how to uses a computer. (e.g. if it is blue and underlined). Although most corporate systems are not yet as easy to use, GIS is rapidly adopting a more Web-friendly approach. Now that much of the protracted AM/FM/GIS development and conversion work has been completed by most large utilities, a steady stream of internal users are demanding access to the resultant data. But, unlike traditional users, these new users may not necessarily be GIS users exclusively. Instead, only occasional access – whether local or remote – may be required. As such, the demand for expanded GIS applications that can be most easily facilitated by the Web is increasing daily.

The dramatic reductions in the cost per seat is certainly good news for end-users. Better still, the results derived from web-based GIS can easily be shared with the rest of the world through a simple – and now very familiar -- point and click routine.

The Web changed the very nature of the relationship between supplier and end-user. Thanks to the Web, software can be ordered and downloaded on-line, 24 hours per day. Some suppliers provide free trial versions, web-broadcasts and tutorials. User groups and email list servers provide an almost instant contact with fellow GIS specialists who often can answer complex questions at no charge.

Wireless applications will likely have an easier time being accepted than early GIS systems. For many years, GIS was almost unheard of outside a small circle of technologists. Today's wireless technology is already pervasive – not just among utilities but in our everyday lives. However, the true productivity gains of wireless technology will ultimately come from driving many of the previously centralized applications to the field operations level for easy access and use by field crews without host system intervention.

Because of the nature of electric utilities (i.e., assets spread out over an expansive service territory) and the presence of a large mobile workforce, wireless connectivity looms large as a potentially valuable solution set. Still, the sometimes spotty geographical coverage and insufficient bandwidth to support increasingly robust mobile applications continue to impede the advancement of wireless in the utility market. Fortunately, a convergence is taking place between wireless and mobile technology that allows a significant amount of data to be stored in the field device itself and permits wireless access when the latest information is required. While it is clear that utilities want wireless/mobile technology, they are still looking for the mission-critical applications that their field crews will sponsor and use.

Still missing, in my opinion, is that must-have "killer app" that will make field force automation mandatory. Aside from some technical issues such as coverage, bandwidth and security, other factors such as cost and form-factor are holding back what is already a burgeoning segment of the market. Much of that hesitation will likely be overcome when the right application finally comes along. Too often the field system benefits the "back office" far more that the field crews. Replacing a map-book and clipboard with computer hardware that automatically updates the corporate system is not a motivator for a lineman. Looking forward, however, there is no doubt that new technology will eventually spawn new applications that will better balance the benefits between the field and the back office.

Because wireless technology is highly vulnerable to invasive forces, security issues must also be addressed. Indeed, for many users each additional level of security imposed represents another deterrent to deploying and using the system. Currently, there are three central concerns in the security arena: (1) Stealing data from the airwaves; (2) Stealing bandwidth (for Web surfing or other non-productive activities); and (3) Gaining corporate system access via the wireless connection. Yet although concern #1 is reasonably handled through data encryption; #2 can be easily handled

with password protection; and #3 can be overcome through a combination of firewalls, passwords and active device authentication, every level of security remains vulnerable and adds to concerns about broadening user access to the data.

Conclusion

There are plenty of GMCS opportunities in the in the electric utility marketplace. Mergers and acquisitions present new challenges for systems integrators, new versions of software force end-users to evaluate the need to upgrade and new applications keep expanding the market.

Huge opportunities are evolving for the wireless and mobile computing segment now that the need is understood and the demand is there — waiting to explode. Non-traditional systems such as work order and outage management present a next logical step for AM/FM/GIS developers.

Predicting the future is always a difficult task. What makes it a bit easier in the IT industry is that trends are often driven by the technology, and hence by the technology makers. When asked what he thought was next for AM/FM/GIS, Arthur Spencer, Executive Vice President, Utilities & Communications, Intergraph Mapping & Geospatial Solutions told me, "AM/FM/GIS technology must move beyond its traditional role as a stand-alone application and become the core enabling technology of an integrated Geospatial Resource Management (GRM) system. GRM models a utility's distribution infrastructure and supports all the work processes involved in designing, constructing, analyzing, operating and maintaining the network. When customers report outages, GRM predicts devices that have failed and expedites response to those situations. The end result is improved customer service and lower operating costs. The return on the technology investment is much greater with GRM through quantifiable hard-dollar improvements. GRM is where Intergraph can help."

This message of building GMC solutions that support the business model, are integrated with other systems, and drive down the operating costs is a message that is consistent among all GIS suppliers.

Users can expect (and will get) easier to use systems that won't require a degree in electrical engineering or cartography. These systems will be delivered to the desktop, shirt pocket and web browser quickly, easily and at an increasingly affordable cost. So if you're asking yourself the question, "What comes next?" The answer is: Just about everything! ■

About the Author

Chris Harlow has over 30 years in the IT profession. He is the founding president of GITA, editor of The Harlow Report-Geographic Information Systems (www.theharlowreport.com) and was engaged as the lead analyst for the InfoNetrix Market Forecast for GMCS in the North American Electric Utility Industry. He may be reached at charlow@charter.net

Welcome to San Antonio and GITA's 26th Annual Conference and Exhibition. This is yet another exciting and educational milestone on our collective journey riding the geospatial frontier.

We are pleased and excited to present several unique elements and educational opportunities to this year's event. Whether you are a first-time attendee or seasoned veteran, Conference 26 will provide each of you with the opportunity to learn hands-on fundamentals of geospatial information technology (GIT) from industry leaders, discover the latest technologies and trends, and share experiences with your peers.

The Conference Committee has done an outstanding job of assimilating fresh content—including invigorating topics, novel speakers, and new materials–into one complete and comprehensive program. You'll find some recurring themes of integration and interoperability, but also new educational tracks that may hold the key to future success: Disaster Management, Global Solutions, and Innovative Technologies.

All of the conference seminars have been completely redesigned. Together, they cover a broad range of presentations introducing innovative applications of GIT as well as mainstream expertise and experience that can help guide you to achieve operational and business goals. The panel discussions include "What's Next? Let's Look Ahead," "Model Law for Surveying," and the not-to-be-missed "Homeland Security." Our panel experts will offer insightful and interactive discussions, encouraging audience participation and feedback.

This conference presents one of the industry's premier product and services exhibitions, with more than 100,000 square feet of exhibit space hosting more than 130 exhibitors demonstrating and presenting innovative products and solutions. You'll discover functional and interoperable component technology as well as solutions to improve service delivery and gain a competitive advantage.

Several astounding events in the past few years combined with the current economic climate have forced budget cuts and required many organizations to restructure their strategic focus, shifting from technology projects to managing and protecting assets and our nation's critical infrastructure. This year's ExecuNet for the CXO track was designed to offer the corporate leader insight and lively discussions between policymakers in Washington, DC, and the executives of leading utilities and local government agencies.

The 2003 Annual Conference Committee and I invite you to share in this forum experience and spur your organization in learning the compelling value of geospatial technology for your business success.

Susan K. Powell, Conference 26 Chair, Miner & Miner

Schedule at a glance

Saturday, March 1

Registration; 1:00-5:30 p.m.

Sunday, March 2

Registration; 7:00 a.m.-5:00 p.m.

Continental Breakfast; 7:00-8:00 a.m.

Seminars; 8:00 a.m.-noon

Henry A. Emery Educational Awards Luncheon; Noon-1:30 p.m.

Seminars; 1:30-5:30 p.m.

Monday, March 3

Registration; 7:00 a.m.-7:00 p.m.

Continental Breakfast; 7:00-8:00 a.m.

Seminars; 8:00 a.m.-noon

Lunch; Noon-1:00 p.m.

Opening Session; 1:30-2:45 p.m.

Exhibits Open; 3:00-7:00 p.m.

President's Reception; 7:00-8:30 p.m.

Tuesday, March 4

Registration; 7:00 a.m.-6:00 p.m.

Continental Breakfast; 7:00-8:00 a.m.

Scheduled Private Demos; 7:00 a.m.-11:00 a.m.

Educational Sessions; 8:00 a.m.-noon

Lunch; Noon-2:00 p.m.

Exhibits Open; Noon-6:00 p.m.

Birds of a Feather; 1:00-2:45 p.m.

Panel Discussions; 3:15-5:00 p.m.

Exhibit Hall Reception; 5:00-6:00 p.m.

Scheduled Private Demos; 6:30-9:30 p.m.

Wednesday, March 5

Registration; 7:00 a.m.-3:00 p.m.

Continental Breakfast; 7:00-8:00 a.m.

Scheduled Private Demos; 7:00-10:00 a.m.

Educational Sessions; 8:00 a.m.-noon

Exhibits Open; 11:00 a.m.-3:00 p.m.

Lunch; Noon-1:00 p.m.

Panel Discussion; 1:00-2:15 p.m.

Closing Reception; 3:00-5:00 p.m.

Exhibitors by Company

As of January 31st 2003

Company	Booth#
4DataLink, Inc.	921
ABACO SRL	206
Advantica	526
American City and County and T&D World	518
Amrel Systems LLC	423
Apex Geospatial Data Services	405
Armilian Technologies, Inc.	511
ASI	702
Autodesk, Inc.	902
Avineon, Inc.	305
Ayres Associates	531
BAE SYSTEMS ADR	411
Byers Engineering Co. SpatialAge Solutions	555
Cable Constructors, Inc.	903
Cadcorp, Inc.	930
Condor Earth Technologies, Inc.	261
Cook-Hurlbert, Inc.	918
Data Conversion, Inc.	754
Dawn Corporation	843
DeLorme	848
DigitalGlobe	747
Electric Energy Publications	407
EMA, Inc.	504
Emery DataGraphic, Inc.	342
ESEA	710
ESRI	640
Federal Geographic Data Committee	208
Field Data Services, Inc.	311
FieldSoft Technologies	358
Flores Technical Services	336
Gamber-Johnson	355
GE Power Systems	324
GenaWare	845
GeoForce, Div. of Lost Time Control West	340
Geographic Data Technology	510
Geonetics, Inc.	721
GeoSpatial Innovations, Inc.	254
Geospatial Solutions	818
GEOTec Media	536
Graphic Technologies, Inc.	354
Great Arc Technologies, Inc.	636

Company	Booth#
Hansen Information Technologies	830
Hitachi Software Global Technology	304
IDEAL.com	609
Idevio	861
IIC Technologies, Inc.	356
Imaging Technologies Software Solutions	822
Integrated Mapping Services, Inc.	212
Intergraph	718
IONIC Enterprise	246
Itron	426
Itronix Corporation	719
James W. Sewall Company	937
JCMB Technology Inc.	508
Juniper Systems	844
KEMA Consulting	600
Korea geoSpatial Info. & Comm. Co.,	245
Lakeview Technology, Inc.	460
Laser Atlanta Optics, Inc.	723
Laser Technology, Inc.	630
LaserCraft, Inc.	255
Laser-Scan Inc.	409
Layton Graphics, Inc.	410
Leica Geosystems	509
Lind Electronics, Inc.	361
Linnet, The Land Systems Co.	725
LizardTech, Inc.	210
LogicaCMG	800
M.A. Young & Associates, Inc.	418
M.J. Harden Associates, Inc.	655
MapFrame Corporation	404
MapInfo Corporation	318
MAPSearch	730
Maptech, Inc.	612
MDSI Mobile Data Solutions	824
MESA Solutions, Inc.	442
Michael Baker Jr., Inc.	748
MicroSlate Inc.	313
Millennium Int'l. Tech., Inc.	241
Miner & Miner	736
Mobile Mounting Solutions, Inc.	356
MOORE Resource Sys. /Enghouse Sys.	247

Company	Booth#
National Imagery & Mapping Agency	928
NMT Corporation	742
Obvient Strategies, Inc.	761
Open GIS Consortium, Inc.	960
Osmose	436
Panasonic Computer Solutions Co.	454
Pangaea CAD Solutions, Inc.	758
PennWell	712
PlanGraphics, Inc.	760
Platts	520
Power Engineers, Inc.	437
Power Technologies, Inc.	611
RADARSAT International	925
RAMTeCH Software Solutions, Inc.	309
Red Planet Consulting, Inc.	243
Rolta International, Inc.	419
Safe Software	346
Sanborn	731
Severn Trent Systems	836
SHH GmbH System Haus Hemminger	659
SophSys, Inc.	829
Spatial Business Systems, Inc.	408
Spatial NetWorks, Inc.	727
SPATIALinfo	901
Spirit Business Solutions, LLC	307
Stewart Geo Technologies	608
Surdex Corporation	755
Sykes Enterprises Inc	649
Tadpole Cartesia, Inc.	310
Tensing-SKS	218
TerraPrise	239
The COGNET Group, Inc.	537
The Schneider Corporation	743
Tobin International, Ltd.	810
Trimble	257
Utility Automation Integrators, Inc.	910
Utility Business Services, Inc.	708
VARGIS LLC	204
WalkAbout Computers	357
Wellsco, Inc.	849
Westech Information Systems Inc.	237
WTI Advanced Technology Ltd.	842

Floor Plan

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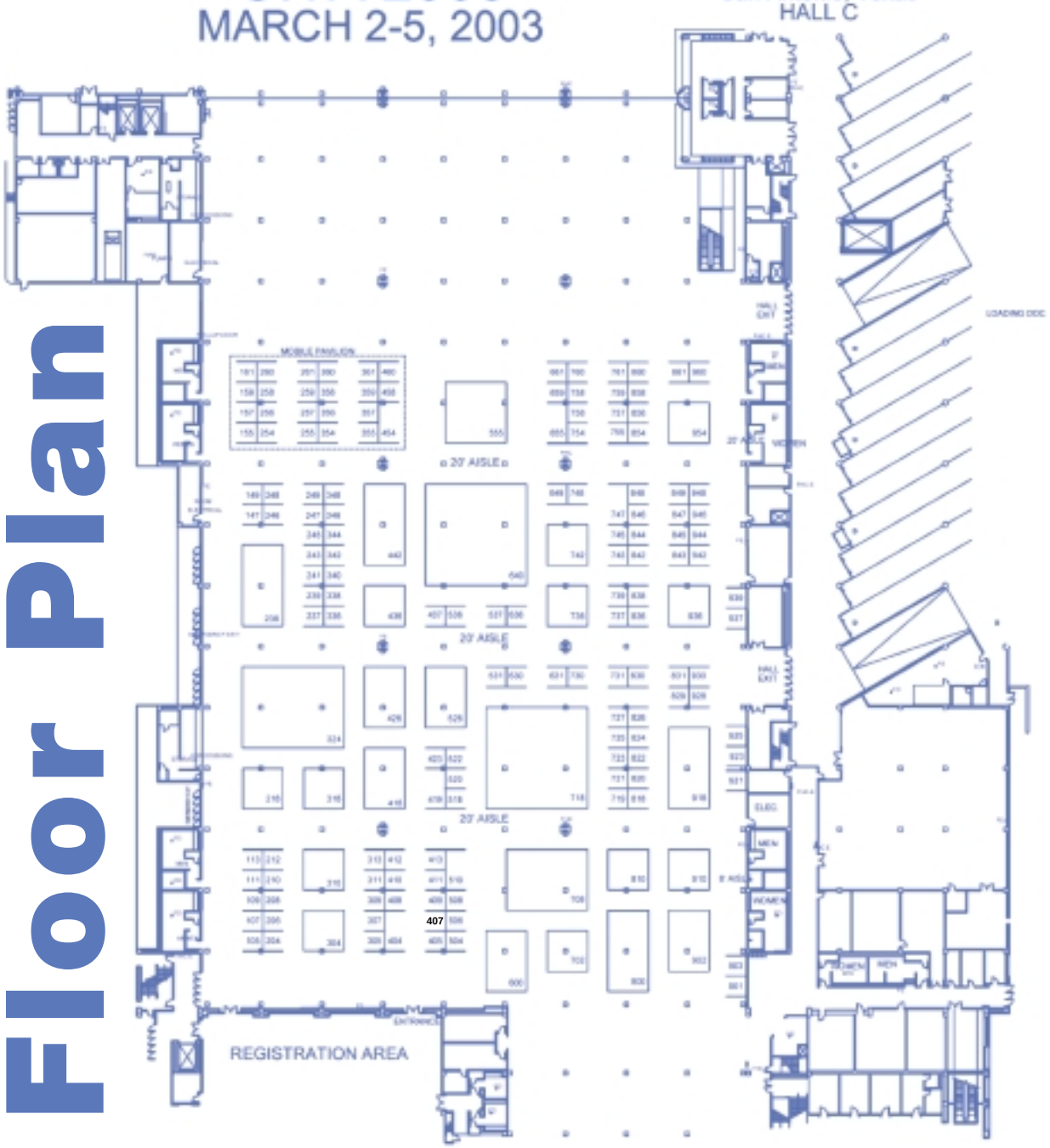

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Autodesk GIS Solutions Streamline

Mapping and Data Distribution for Missouri Utility

City Utilities of Springfield (CUS) has provided southwest Missouri with gas, electricity, water, and public transportation services for more than 50 years. Until the late 1990s, map production at CUS was a labor-intensive, paper-based operation. Employees kept plant facility maps at their desks in hanging files or in detail books that were updated once every three months. The utility also lacked a technology that could distribute maps over the Internet. Because of delays inherent in the manual transfer of documents, by the time maps got to inspectors and crews in the field, much of the information was significantly outdated.

To make matters worse, the company's 1970s-era technology couldn't translate between geographic coordinate systems, such as the North American Datum of 1983 (NAD83) and the Missouri State Plane Coordinate System. These and other formats had to be translated manually, a process that slowed data exchange to a crawl.

Solutions for Productivity

In 1997 CUS chose Autodesk Map to automate its mapping tasks. The software provided full mapping and analysis functions, including tools for map creation, data integration and exchange, and for importing and exporting data to many GIS formats. CUS's existing maps had been based on the NAD27 standard, previously used by the external organizations with which CUS shared map data. When these groups migrated to the newer NAD83 format, CUS lacked the software to make the transition that would allow its people to continue exchanging map data with the outside world. Manual conversion of formats, the only immediate alternative, was difficult and prohibitively time consuming. And so, CUS first tested Autodesk Map by translating pipeline survey data between NAD83 and NAD27 formats. Could the software accurately translate between these systems without destroying the geometric integrity of the original file?

Not only was the answer "Yes!" but Autodesk Map could also translate maps sent to the company in coordinate systems other than NAD83. "The fact that MapGuide could do both and retain spatial accuracy and all our attributes was a critical factor in our selection of this software," said Gaylon Smith, senior engineering technician at CUS.

Automation of Paper-Based Operation

CUS then applied Autodesk Map to the task of automating the paper-based processes used in developing and distributing plant facility maps. In the old days, eight-foot-square wall maps were put together from as many as 1,100 detail maps of as-built plans, drawn in AutoCAD® software. "It took two or three technicians to draw the detail maps for each commodity—gas, electricity, and water," said Mapping and Surveying Department Supervisor Richard Cox, "and other specialists to redraw them into individual wall maps. The process took up to a week." Today, with the help of Autodesk Map software, *one* person can build a wall map in eight hours just by querying data from the detail maps. "We are saving $23,000 a year in wall map production alone," explained senior engineering technician Melissa Lawson.

Data Communications Solution

In 2001 CUS streamlined its data communications with Autodesk MapGuide® software, which provides all the tools needed for distributing maps and related information to an internal intranet or across the Internet. With Autodesk MapGuide, users can now work in a range of formats, including ArcView, MIF/MID (MapInfo Interchange), and MicroStation DGN. Autodesk MapGuide software can also directly read Autodesk Map DWG files, ArcView Shape files, Oracle Spatial and many types of georeferenced raster imagery. The department downloads parcel maps in SHP format from the county assessor database and overlays the facility maps onto them. Autodesk MapGuide is then used to distribute the composites to the respective departments.

Multiple Applications

CUS's Developer Services Department uses Autodesk Map to see detailed maps of individual distribution lines and parcels, and it uses Autodesk MapGuide to pull all the AutoCAD files of the development into one large map. When utility outages occur, supervisors in the field no longer have to go into the office to get the information they need. With Autodesk MapGuide they can log onto a password-protected site and pull up the latest plant facility maps.

Training and Implementation

Training and implementation for Autodesk Map and Autodesk MapGuide took about three months, said Lawson. "Our technicians first went through the software, looking for operations that could be automated by managers or macros. Once we tested these routines and were happy with the results, we moved forward and implemented the software companywide."

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LogicaCMG

An IT Powerhouse Delivering Asset and Resource Management Solutions to Utilities Worldwide

LogicaCMG: A New Name for a Worldwide IT Powerhouse

LogicaCMG is a global solutions company providing management and IT consultancy, systems integration and outsourcing services. With additional expertise in wireless technology, the company supports clients across diverse markets including energy and utilities, telecoms, financial services, industry, distribution and transport, and the public sector.

Formed in December 2002 through the merger of two respected solutions providers – Logica and CMG – the company has offices in 34 countries and over 60 years of combined experience in the IT services arena.

Logica and CMG built their reputations on project and services dependability and excellence. Now as one company, we continue to support our combined reputations for solving real business problems with real solutions that are delivered on time, and within budget.

LogicaCMG is playing a leading role in developing and offering innovative products and services that support individual enterprises or entire markets. In the energy and utilities arena, we focus our offerings on the day-to-day reality of improving back office/field operations and delivering innovative solutions for competitive markets.

LogicaCMG In Asset and Resource Management for Energy and Utilities

In North America, LogicaCMG's Energy and Utilities Division is the leading provider of fully-integrated Asset and Resource Management solutions including work management and GIS. Asset and Resource Management (ARM) refers to an enterprise-wide solutions approach that includes the systems and processes that manage a utility's physical assets and human resources in order to achieve operational excellence in transmission and distribution organizations.

LogicaCMG's ARM solution enables utilities to streamline business processes, manage the entire work stream, improve resource scheduling, control operational costs, manage maintenance and regulatory compliance activities, extend the useful life of existing assets, increase systems reliability, expand performance and analysis reporting capabilities, and improve customer service.

The product components used in the fully-integrated ARM solution include:

- WMIS, the Work Management Information System
- eWMIS, web-deployed WMIS
- Mobile WMIS, field deployed WMIS
- Work SchedulerPlus, a constraint based scheduling tool
- FMDR, the Facilities Management Data Repository for Asset Management
- Compliance Tracking, a solution to manage gas utility inspection and maintenance work
- FieldSmart™ Mobile Suite, a map-based field solution from Logica's solution partner MapFrame
- MOSAIC™, a fully featured SCADA solution
- DMS, the Distribution Management System, a real-time system for the management of Distribution Networks
- InfoServer, a technology that enables the ARM solution users to query ARM data and create standard and custom reports without affecting the performance of the production systems
- IMF, the Integration Management Framework, an advanced integration technology that ties everything together in a modern, message-based environment

Supported by a dedicated Product Center and a comprehensive program of on-going support services, ARM is the definitive solution for utilities that want to position themselves as market leaders.

Why LogicaCMG Is the Right Partner for Energy and Utility Companies

Today many solutions companies are pulling away from serving difficult markets, rewriting their mission statements, reducing their support, and in general finding themselves unable to help their clients weather the current economic rough seas.

But LogicaCMG hasn't taken that approach. We continue to pursue the same mission that has produced success for our clients. We help leading organizations worldwide achieve their key business objectives through the innovative use of information technology.

If you are a company in the energy and utilities industry, choosing a solutions partner doesn't get any easier than choosing LogicaCMG. The reasons why are straightforward:

- We provide industry leadership where it counts, developing answers to tough issues in tandem with our client companies.
- We truly listen to our clients so we can understand their businesses and their business issues.
- We use our understanding to develop solutions that solve significant business problems.
- We combine our innovative technologies with those of selected solution partners in order to define responsive, comprehensive solutions.
- We deliver concrete results to our clients using capabilities that are demonstrated and proven.
- We deliver what we say we will when we say we will.

LogicaCMG provides solutions that matter. Just as importantly, we keep our focus on what matters most – the success of our clients and their marketplace.

LogicaCMG is the number two European quoted IT services company and is listed on both the London and Amsterdam stock exchanges. More information about LogicaCMG is available from www.logicacmg.com/us.

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Compliance Tracking

Work Management

Distribution Management

Facilities Management

Mobile Computing

Scheduling

SCADA

Need help managing your work, assets and resources?

LogicaCMG's ARM Asset and Resource Management solution is a fully integrated suite of products that eliminates the need to "stick it together" while enabling utilities to streamline business processes and control operational costs. ARM includes:

- WMIS, the Work Management Information System
- eWMIS, web-deployed WMIS
- Mobile WMIS, field-deployed WMIS
- FMDR, the Facilities Management Data Repository for Asset Management
- CTS, the Compliance Tracking System
- *FieldSmart™ Mobile Suite*, a map-based field solution
- Work Scheduler*Plus*, a constraint based scheduling tool
- InfoServer, a web enabled data retrieval and analysis tool
- IMF, an advanced systems integration technology to interface ARM with GIS, CIS, OMS, Dispatch and other systems
- MOSAIC™, a mature, fully featured SCADA
- DMS, the Distribution Management System

Stop worrying! Let the experts make your life easier. LogicaCMG delivers a fully integrated product suite and the benefits that go with it. Use our 34 years of proven success in utility IT solutions, products, systems integration and consulting to manage your toughest issues.

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OmniSTAR, Inc. is at the forefront of DGPS technology.

Over the last 20 years the development and introduction of the satellite based Global Positioning System (GPS) has revolutionized navigation and positioning practices worldwide. Differential GPS (DGPS) techniques can provide worldwide real time sub-meter horizontal positioning relatively easily and inexpensively. OmniSTAR, Inc. is at the forefront of DGPS technology.

Part of the Fugro Group, one of the world's foremost survey service companies, OmniSTAR's involvement in precise positioning goes back over 20 years. In the mid-1980's, before GPS was fully operational, the pre-cursor of OmniSTAR provided North America with the World's first round-the-clock satellite positioning service.

With the availability of a fully operational GPS constellation, OmniSTAR, Inc. has built on this expertise in satellite technology and precise geo-location to develop a world-wide Differential GPS service incorporating proprietary "Virtual Base Station" (VBS) wide area differential solution techniques which provide unequaled accuracy.

The removal of Selective Availability (SA) by the US Department of Defense in May 2001 resulted in unaided GPS becoming far more accurate and stable than before. However, a differential correction is still required for applications where horizontal accuracies of better than +/- 8 meter (25 feet) are required.

The foundation of OmniSTAR's service in each area of operations is a network of precisely located reference stations. The range correction data for all satellites in view at all these stations is compressed and broadcast over very large areas from dedicated transponders on geo-stationary satellites. The user's receiver takes this data, makes local corrections for atmospheric effects, and generates an RTCM-SC104 correction "tailor made" for its location.

Using satellite re-broadcast overcomes the range limitations associated with ground-based differential transmissions such as Coastguard 'beacon' and fm sideband, and OmniSTAR's wide area solution corrects for errors, such as multi-path and long baseline offsets, that are commonly associated with these single reference station solutions. The result is consistent, high quality differential corrections that are available anywhere over most of the world's major landmasses.

As a well-established commercial system, OmniSTAR's corrections are of consistently higher accuracy and reliability than the various 'free' tax-payer funded systems. Furthermore, its coverage is not constrained in the same manner as government run systems and it is available virtually world-wide.

The introduction of a global 'L' Band service has meant that a growing number of DGPS manufacturers are implementing OmniSTAR capability into their products. The list of OmniSTAR capable receivers includes: the Trimble Pro-XRS, AgGPS 132 and AgGPS 114, the CSI LGBX and LGBX Pro, the Starlink Invicta 210S, the Satloc SLX, and the Sokkia Axis3. These receivers, which are small, lightweight and require very little power, can easily be mounted in a back-pack or vehicle.

OmniSTAR applications include: agriculture (yield monitoring, variable rate chemical application, soil sampling, field mapping, vehicle guidance, agricultural aviation), forestry, 911 Emergency Services, utilities mapping, microwave path analysis, power distribution mapping, aerial photogrammetry, airborne geophysics, missile tracking, autonomous vehicle guidance both terrestrial and airborne (eg: Globalhawk), EPA activities, etc

New in 2003

The latest development from OmniSTAR, introduced in the 3rd quarter of 2002, is the revolutionary OmniSTAR HP (High Performance) service. Having reached the current technical accuracy limits of real time L1 only DGPS operations (<+/- 1 meter) OmniSTAR has perfected a unique Wide Area High Precision System. Using a suitably configured dual frequency receiver, the new OmniSTAR HP system should provide accuracies of better than +/- 15cm (horizontal) over entire continents.

This will allow the user to achieve near 'RTK' levels of accuracy without the cost and logistic difficulties associated with operating a standard RTK system. Rather than having to use two dual frequency receivers and a high speed data link almost equivalent results will be achievable with a single dual frequency receiver and access to the OmniSTAR HP broadcast. A typical 24 hour plot of OmniSTAR HP shows 1 sigma horizontal values at the 2 – 3 cm level and 1 sigma vertical error at the 7 cm level (see figure 1.below).

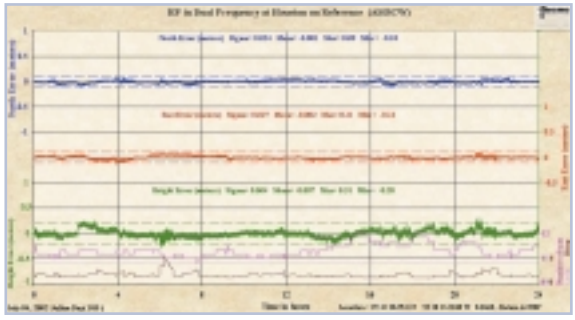

Figure 1.

By providing this level of accuracy with reduced hardware expenses and logistic requirements, the OmniSTAR HP service has the potential to revolutionize GPS usage in GIS and survey applications. Many projects, which require better than sub-meter accuracy and are currently being undertaken using RTK techniques, will be completed in less time at reduced cost by using this new service.

OmniSTAR operates world-wide with main offices located in the United States, the Netherlands and Australia. OmniSTAR VBS is available virtually world-wide and the new OmniSTAR HP service is being introduced initially in North America, Europe and Australia.

OmniSTAR
The Global Positioning System

For more information please visit our website www.omnistar.com or contact us direct on

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Mobile GIS — the New Way of Working

Trimble is a key player in the new way of working.mobile GIS. Mobile GIS is the use of geographic data in the field on mobile devices. It's an evolution of how the enterprise database is used and managed within an organization. Mobile GIS integrates three essential components: global positioning system (GPS), rugged handheld computers, and GIS software. Bringing these technologies together makes the enterprise database directly accessible field-based personnel.whenever and wherever it is required.

Think of the positive benefits of mobile GIS during an emergency. When utility crews or emergency workers are out managing the impacts of network outages they need to have current and accurate information to make decisions that will affect lives and resources. With mobile GIS field teams can respond quickly to changing conditions and make important management decisions on-the-spot to repair critical network infastructure, change in-field management tactics, or inform other crews of the magnitude of the disaster.all by using up-to-the-minute data.

Trimble provides a complete range of products that provide the accuracy and flexibility required for mobile GIS. These data collection and data maintenance systems enable you to quickly collect high-quality data and make confident decisions in the field.

Trimble's mobile GIS tools

GeoExplorer CE series

The GeoExplorer® CE series has set the standard for mobile GIS applications. Both the GeoXT and the GeoXM are a unique combination of GPS and the windows CE operating system - all in one compact rugged handheld.

Quality GPS

The GeoExplorer CE series gives you accurate, reliable GPS data. For extra precision, differentially correct your data in real-time in the field using WAAS or postprocess the data in the office using Trimble's online data processing service, GPS Pathfinder Express.

Versatile Windows CE

Windows CE gives you easy options that enhance your workflow. Connect to a cell phone for wireless access to web map servers, email, and the Internet. In the office, use the fast USB connection to a desktop computer for data transfer.

TerraSync

The TerraSync. software runs on Trimble's GeoExplorer CE series handhelds and is designed to integrate seamlessly with industry-standard GIS systems.

With the TerraSync Professional software it's simple to upload existing GIS data for relocation, verification, update and mobile gis applications. You can filter the exact feature you need to revisit, and a graphical navigation screen guides you back to it! Plus, the TerraSync Professional software has a real-time map display that supports raster background maps.including maps from ArcIMS and Open GIS Internet servers.

GPS Pathfinder Express

With the GPS Pathfinder® Express service, you can postprocess your field data via the Internet. The result is higher accuracy, better quality data for your GIS. This Trimble service is easy and affordable. Simply submit your GIS data via e-mail or directly on the GPS Pathfinder Express website. Your data will be processed using your preferred options and returned to you in your choice of common GIS format.

Trimble

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For an interactive look at the company, visit Trimble.s website at www.trimble.com.
To see the full range of Mapping and GIS solutions, visit Trimble.s website at: www.trimble.com/gis.

Circle 179 on Reader Service Card

The African elephant matriarch relies on

her memory to protect the herd. Over time, she builds a social memory of animals from outside the family. By recognizing outsiders as friend or foe, she can alert the herd and protect them from danger. Do you have the memory to survive in the field?

Introducing the new GeoXT™ from Trimble. The GeoXT is the new standard GPS platform for mobile GIS that offers you maximum versatility with Windows CE software. The GeoXT features built-in, non-volatile flash memory so your valuable data is always safe. Available with either 128 or 512 megabytes of flash memory, the GeoXT features 32 MB of RAM for powerful processing performance. With a rugged design and all-day battery, the GeoXT goes wherever you go and lets you access your data any time, in any conditions. It's what you need to survive in the field.

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Introduces New Software Products Automating the Integration and Alignment of Maps and GIS Data

ESEA, a leader in GIS integration technologies, offers MapMerger™ and MapMover™ software modules that extend the functional capability of ESRI's industry-standard ArcGIS™ software. MapMerger provides tools for automatically matching, aligning and conflating two different map representations of the same region and MapMover™ aligns maps to precise geometries to create an entirely new centerline map. Both products offer cost-effective solutions to maintain land-base maps to ensure an accurate relationship between customer and facility locations resulting in fast, reliable customer service with significant cost savings for the utility industry.

MapMover simplifies the task of aligning one map representing line features, such as roads, rivers or utility infrastructure, to another more spatially accurate map. At the press of a button, MapMover automatically finds control points to link intersections in each map. MapMover's technology enables extremely precise and rapid "rubber-sheeting" of selected line sequences of various lengths such as highways or rivers. MapMover automates a time-consuming process, accomplishing in seconds what might otherwise take hours to perform.

MapMerger automates the transfer of attributes from an attribute-rich but location-inaccurate source to an attribute-poor but spatially-precise map, such as merging TIGER files from the U.S. Census Bureau with street centerline base maps developed from aerial orthophotography or GPS data. Attributes such as address ranges and associated road names can be transferred to a precise street centerline base map. In addition, attributes such as zip code ranges, utility information and other details can be easily integrated. Other applications include automatically adding or updating with new data from the latest maps or data sources; integrating new source layers; or producing a map indicating differences or changes between data sets. MapMerger automates a labor-intensive manual process with very high levels of accuracy.

High-Speed, High-Accuracy

Both MapMover and MapMerger utilize sophisticated algorithms in an iterative matching process for high-speed and highly accurate results. MapMerger can also automatically split line features, such as street segments for the one-to-one matching required for attribute transfer. Both apply built-in intelligence during the matching process by comparing the number and angle of adjacent line features and working within a maximum search distance as identified by the user. Match information can be saved as simple ASCI files for ease of operation and multi-user capability. In addition, MapMerger correctly handles directional attributes, including address left/right and zip code left/right. It can, for instance, automatically match and transfer attributes for approximately 2,000 road features in less than three minutes, a task that would require many hours if done manually. Its graphical quality control tools enable the hands-on reviewing and editing of the automatic conflation to further ensure highly accurate results. Both products support very large data sets, such as several counties or even an entire state.

Pricing and Availability

MapMover is available in two versions: Standard and Plus, and MapMerger is available in three versions Standard, Plus and Professional. The Plus version adds important capabilities to the Standard version in the way it saves match information and accommodates multiple users, and it is best suited for commercial and government environments. The Professional version of MapMerger combines the powerful features of the Plus version of both products in one fully integrated package. Pricing for a single PC/workstation license of MapMover is $2995 U.S. for Standard and $4995 U.S. for Plus and MapMerger licenses are $3995 U.S. for Standard, $5995 U.S. for Plus and $8995 U.S. for Professional. MapMerger and MapMover are available immediately.

The products run on Windows 2000, Windows NT or Windows XP. Technical support and software maintenance is provided through an annual support fee, and consulting, training and customized implementation services can be arranged. These products are available in the U.S., Canada, European Union countries, several other European countries, Japan, Australia and New Zealand directly from ESEA at www.esea.com.

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- save conflation project
- import match information
- import anchor points
- save match information
- import source and target
- auto point match
- auto line match
- merge source with target
- write result layer
- rubber-sheet layer
- undo auto match
- reset conflation

Manual Conflate
- multiline warp
- multiline delete warp
- multiline match
- multiline delete match
- add point match
- add line match
- delete match
- toggle anchor point
- split line
- unsplit line
- show attribute values
- undo edit

Display
- show target
- show source
- show rubber-sheeted source
- show result
- show point matches
- show line matches
- show grid
- show log
- about MapMerger

Stop by our booth #710 at the GITA conference or contact us for a free evaluation license.

KEMA

Building a Sustainable Competitive Advantage for Utilities

Energy and utility companies around the world are in the midst of unprecedented business challenges. Changes in customer expectations and behavior, an ambiguous regulatory environment, economic uncertainty, demands for increased infrastructure security, industry scandals and the entry of new competitors have made business as usual a thing of the past. Factors like these, combined with falling stock prices and the need to maintain a competitive advantage while restructuring the business, have fueled demands for expense cuts and business processes changes that will improve operational efficiency, while at the same time maintaining the reliability of the world's generation, transmission and distribution networks.

KEMA can help. A global solutions provider for energy and utility companies, KEMA has helped 500 utility clients in 70 countries achieve sustainable competitive advantage through a unique combination of business and technology consulting strategies with hands-on business experience and deep subject matter expertise.

KEMA's 1,400 energy specialists have helped energy and utility companies achieve their strategic and operational goals across the full spectrum of business processes, from generation, to transmission and distribution, to the customer meter. With 75 years of utility experience, KEMA's focus is on helping its clients achieve optimal levels of asset reliability and security at the lowest possible operational cost through focused technical and management consulting, systems integration, testing, training, inspection and certification, and research and development services.

Business and Technical Services for the Operational Nerve Center of Your Core Business

Asset management has become an important issue in the once quiet, monopolistic energy world. Driven by an aging infrastructure, increased demands being placed upon the distribution system and the displacement of traditional cost of service regulation with price caps and performance metrics, the need to optimize the use and performance of the utility industry's large asset base investment becomes increasingly critical. Just as important is the need to dramatically improve the linkage between the asset infrastructure and corporate objectives.

KEMA's business and technical services encompass comprehensive, value-driven asset decision-making that cuts across the utility's functional organization, focusing on both engineering and economic analysis of infrastructure assets. This is one reason that utilities around the world are turning to KEMA to help identify efficiency gains, reduce spending, improve replacement techniques, extend asset life, manage risks across the company and provide rigorous justification for expenditures for regulators and investors.

The expertise provided by KEMA emphasizes:

- Asset and reliability management
- Performance assessment and strategy development
- Control system cyber security
- Power system operations support and training
- Energy management systems/SCADA
- Distribution management/ system automation
- Enterprise systems – GIS, outage, work management, mobile dispatch, ERP, customer services, engineering & design
- Generation resource management
- Certification and testing
- Energy marketing and trading
- Telecommunications
- Renewables and green power
- Demand side management
- Performance based regulation
- Energy industry communications protocols

The technical and management consulting services offered by KEMA include:

- Needs assessment
- Business case analysis
- Operations strategy
- IT strategy
- T&D planning and design
- Business process analysis
- Software engineering
- System implementation
- Business process modeling
- Reliability assessment
- Change management
- Program management
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- Reliability centered maintenance/condition-based maintenance
- Equipment condition monitoring
- Equipment testing
- Training

From enhancing reliability, to automating critical T&D functions, to reducing distribution costs by up to 15%, KEMA is trusted by utilities the world over to help achieve their strategic business objectives.

The KEMA group of companies

KEMA encompasses an integrated group of business units around the world. N.V. KEMA (www.kema.nl) is the parent company, founded in 1927 and headquartered in Arnhem, the Netherlands. N.V. KEMA is a world-renowned electric power consulting, testing and research and development firm.

KEMA Inc. is the North American subsidiary of N.V. KEMA and encompasses the combined experience of the former KEMA Consulting Inc. and XENERGY Inc., which merged this year into a single company. Headquartered in Fairfax, Virginia, with offices worldwide, KEMA Inc. employs more than 400 full-time professionals and leading experts in many facets of the electric power industry.

To learn more about how KEMA services can help you build and maintain a sustainable competitive advantage, contact:

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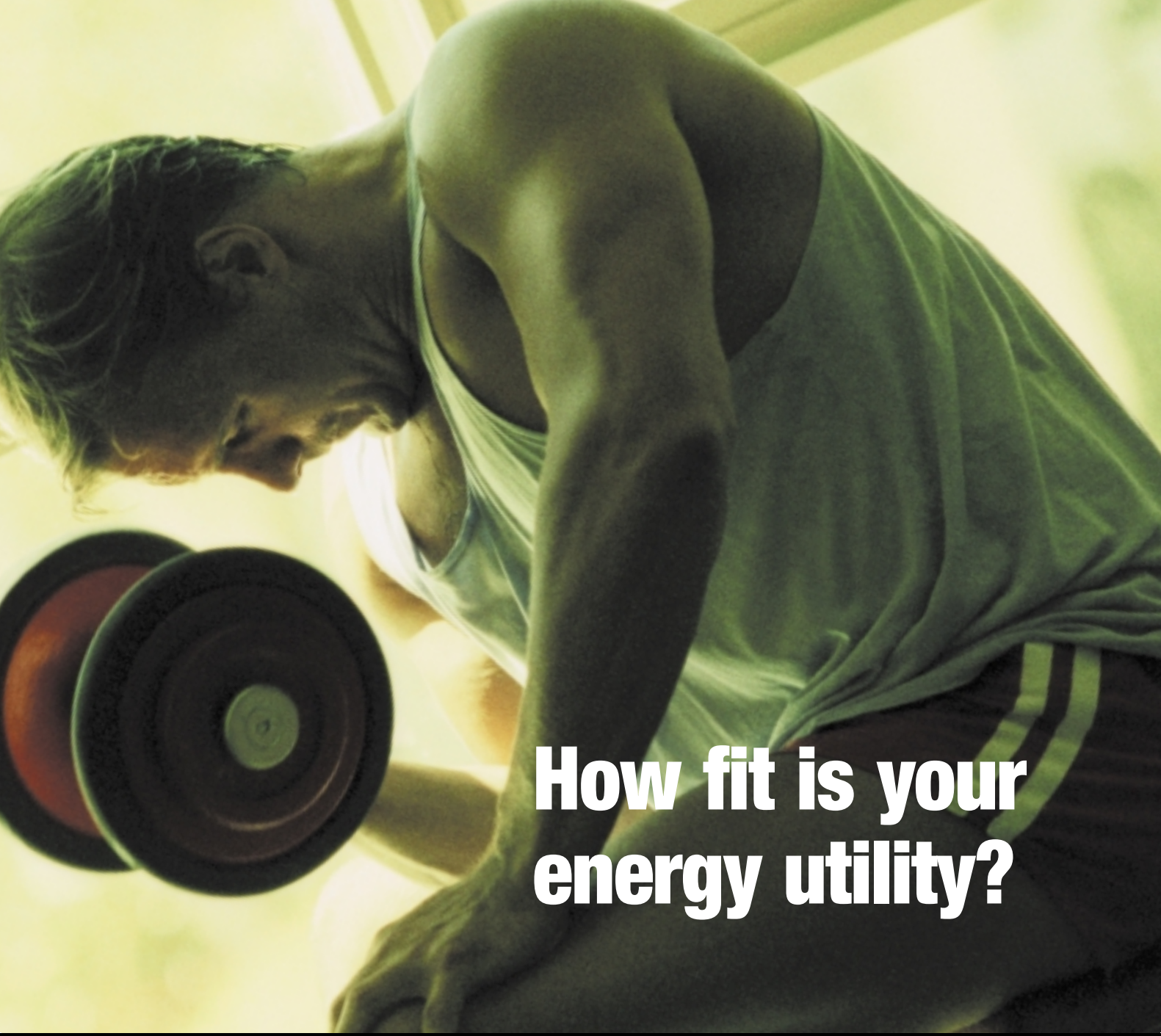

How fit is your energy utility?

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When it comes to energy fitness, how does your utility measure up? Spend a few minutes with one of our energy specialists and find out why utilities across the globe rely on KEMA to help them enhance reliability, automate critical distribution functions and reduce distribution costs by up to 15%.

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By:

Greg Patton
Vice President
Patton & Cooke Co.

PILC cable – We're still living with it

In spite of all the rhetoric about "getting the lead out", most larger North American urban centers are still maintaining some form of medium voltage underground network power distribution system using paper insulated, lead covered (PILC) cables. The introduction of these types of cables goes back to the 1930's, making some of the first cables produced over 70 years old. Many of these cables are still directly connected to their original oil-insulated switchgear and protective devices and continue to give excellent service with minimal maintenance, provided they remain undisturbed.

Most incidences of problems with these older "oil-impregnated" cables occur when they are "disturbed". Routine maintenance, the addition of new connections and new construction puts additional mechanical or electrical stresses on these aging system components. In locations where cables are exposed to the weather, stress fractures in the lead jackets are becoming a significant problem. A breech in the integrity of the lead jacket will allow moisture into the cable resulting in rapid degradation of the cable insulation. As older systems are increasingly pushed beyond their original design operating limits, higher cable temperatures can begin to force oil out of the paper insulation drastically reducing its dielectric strength. On inclined installations, head and tail pressure differences can drain oil from the top of a cable while the lead at the bottom of the cable may swell due to the increased pressures. This will inevitably lead to oil leaks. Replacing the PILC cable entirely with its dry dielectric counterpart would be the ideal solution however, the costs, service disruptions, and logistics involved are forcing utilities to consider maintaining existing installations far longer than their original "get the lead out" schedule mandated.

When the decision is made to remove a section of PILC cable, there are a variety of splicing methods available. Unfortunately the skills necessary to do this type of work are not always being retained by many of the companies with PILC cables on their systems. Some utilities have training facilities in place to maintain and upgrade their personnel skill levels. Others are relying on private companies to provide the expertise when necessary. Despite the decreasing number of skilled workers available, splicing PILC cable to dry dielectric cable often remains the best and/or only alternative to replacing the PILC cable in its entirety.

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The most common methods of splicing PILC cable are: heat shrink tubing, cold shrink tubing or vacuum cast, silica sand filled thermal setting resin transition modules. Of these methods, each has its own benefits and drawbacks. Heat shrink components are relatively easy to install but often there isn't room available to get the heat source directed completely around the tubes and uneven shrinkage may result in improper sealing. Cold shrink components may be more convenient at times but there is not always the space available to easily position the tubes for core removal and the proper application of restricting tapes may be difficult. Vacuum cast, silica sand filled thermal setting resin transition modules are highly reliable. It is unfortunate that in crowded manholes there can be a problem providing the necessary cable length for installing wiping sleeves and cable tray clearances can prevent the use of separable insulated connectors. If neither of these restrictions exists and properly trained personnel are available to do the taping, soldering, wiping and compound pouring, it's hard to beat the reliability and convenience of a vacuum cast resin transition splice.

With shrink tubing splices it is common to have to run the spliced in cross-linked polyethylene (XLPE) or ethylene propylene rubber (EPR) cables to a separate location to make junction bar connections. Often manholes or vaults are already crowded and cannot accept the addition of a splice, junction bars and all the resultant cable connections. The greatest advantage of the transition module design is the combination of barrier and junction bar in one device, allowing the connection of separable insulated connector elbows right at the splice.

PILC cables are often terminated within oil-filled devices by a variety of methods, but generally through a top or bottom entry wiping sleeve. A bottom entry cable presents a "silent" risk for oil-filled devices as it is possible for the oil within the termination chamber to actually migrate within the PILC cable and slowly drain oil from the termination chamber, eventually leading to internal flashover. If the decision is to replace a PILC cable with XLPE or EPR cable, there may be a problem with making the connection to the existing oil-filled connection box. Vacuum cast, silica sand filled thermal setting resin products designed specifically for this type of transitional connection are readily available with a minimal amount of lead time.

For at least the last 10 years the EPA has been asking utilities to get PILC cable out of the ground as soon as possible. There are many problems to be dealt with when deciding to remove PILC type cables. Often the original ducts have shifted or been crushed and the cable is jammed inside. The cable may have bends within the ducting which will not easily straighten out when being pulled. Most often the PILC cable diameter is such that even with removal from the duct, many replacement cables are too large to be installed in the old duct. New cables are now available that are designed specifically to fit inside old ducts. Today, specialized techniques to remove cables from ducts have been developed by a number of companies and cables previously considered lost forever are being removed and recycled. Regardless, this is

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Extremely rugged, lightweight design is as easy to handle as a flashlight.

Meet the world's fastest troubleshooter—the new ThermaCAM™ E2 infrared camera. No other technology helps you find electrical faults faster or easier than infrared. Pinpoint hot spots, measure temperature and store images for quick reporting. And it's affordable enough to equip your entire crew. For more information, call **905-637-5696** or **1-800-613-0507,** or **e-mail ircanada@flir.com.**

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not an easy or short term program and requires the allocation of enormous financial and labor resources to achieve. Any work being done on urban distribution systems means extensive and lengthy interruptions to traffic flow, possibly major renovations to existing electrical installations, removal of old cables and installation of new cables, much of which may require completely new ducting, all in the center of a city. As most of the installed PILC cables are not exhibiting signs of degradation and they are inside ducting, the lead and oil in these cables is temporarily contained. There are a large number of companies able to properly dispose of scrapped PILC cable but from the time it comes out of the ground to its final disposal, it becomes a highly visible and hazardous environmental concern.

Even though all utilities are in a conscious mode of trying to remove lead cable from their system, it is going to be a long time before the work is complete. It's very likely that "getting the lead out" has moved a notch or two down many utilities priorities scale. It is also highly probable that there will still be PILC cable in use in North America in the next century. ■

Our Mission:
Quick action during emergency blackouts

*** In case of an Emergency, it is important to:**
Evaluate • Plan • Rebuild • Save • Secure

*** Prevention**
By designing • By examining

Why Choose SBB Products?

- Higher quality of product and services: Components that are easy to dismantle and which can be reused;
- Shipping: Cost reduction due to minimal time and manpower requirements;
- Storage: Component are resistant to distortion of any kind.

Our technology:

412 X 412: *New technology*
Each product is the result of recent advances in technology and is fully tested. The 412 X 412 mm is now a basic component for the Emergengy Restoration System (ERS). It allows restoration of the transmission line in a very short time. It is a quick, efficient and cost effective solution.

716 X 716: *New technology*
Emerging from the latest technology, the 716 X 716 mm model can restore a transmission line a very short time.It is a quick, effective and cost efficient solution.

750 X 750: *A Classic*
The 750 X 750 mm mast is a product of proven technology for companies who have bought ERS from SBB for the past years.

The characteristics are the following:

• Versatile use • Easy storage
• Easy handling • Simple assembly
• Complete technical Support
• Calculation and analysis tools

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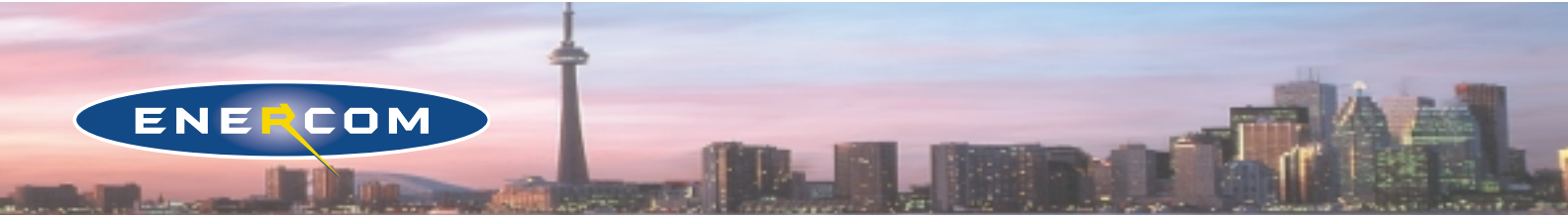

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Canada's Leading Two-day Energy Conference

Welcome

The Ontario electricity market has moved from a deregulated, competitive market in May 2002 to a re-regulated market in November 2002.

Is competition still viable in the new market? Are there sufficient Government incentives and monetary rewards to attract new investment in electricity generation to ensure an adequate supply for Ontario? What are the new rules and regulations that will affect producers, distributors, sellers, marketers and major consumers of energy? What is the future of Ontario's energy market?

These are a few of the issues that will be addressed by leading industry experts who will clarify the structure of the new market, identify new opportunities and suggest strategies for continued success.

We sincerely hope that you will take advantage of this opportunity to attend the 4th annual EnerCom conference – an information packed two-day program developed by key professionals in the energy community.

Tuesday, March 4

Conference
7:45 a.m. - 4:30 p.m.

Exposition
9:00 a.m. - 4:30 p.m.

Wednesday, March 5

Conference
7:45 a.m. - 4:30 p.m.

Exposition
9:00 a.m. - 12:00 noon

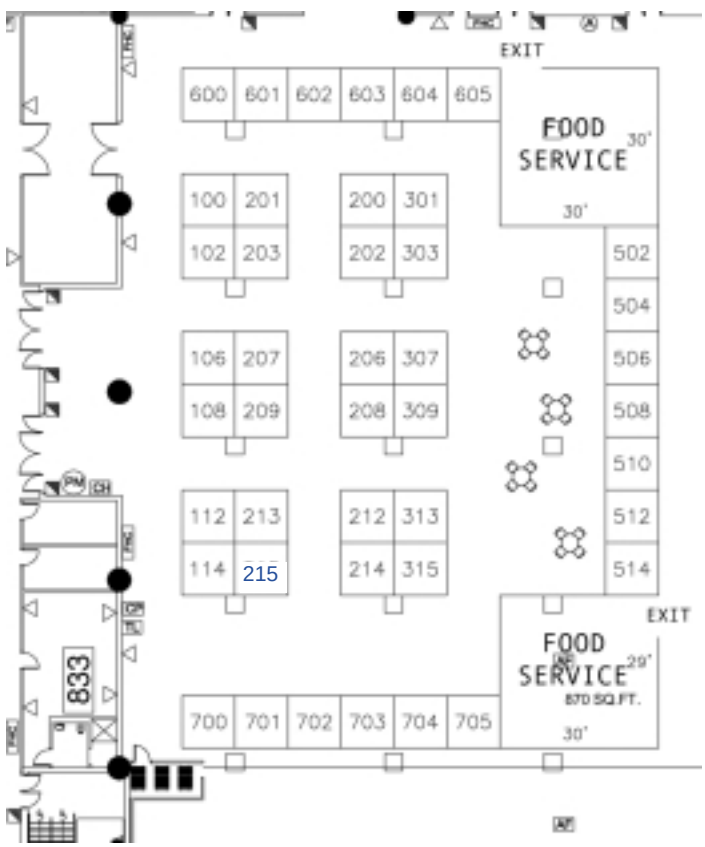
Exhibitors List

Company & Web	Booth #
Acres International www.acres.com	704
Advanced Battery Systems Inc. www.advancedbattery.ca	601-602
AESI Acumen Engineered Solutions www.aesi-inc.com	207
Canadian Cable Injection Services www.transelec.com	702
Current Energy Technologies Inc. www.currentenergytech.com	212
Daffron and Associates Inc. www.daffron.com	209
Dupont Canada Inc.	301
Earth Energy Society of Canada www.earthenergy.ca	201
EDA www.eda-on.ca	214
Elecsar Engineering Ltd www.elecsar.com	114
Electric Energy Publications www.electricenergyonline.com	215
Electrical Contractors Association of Ontario www.ecao.org	703
Electrovaya Inc. www.electrovaya.com	307-309
ESRI Canada www.esricanada.com	701
FibreWired Networks www.fibrewired.com	208
FVB Energy Inc. www.fvbenergy.com	102
InfraRed Imaging Solutions Inc. www.iristhermography.com	112
Kinectrics www.kinectrics.com	106
Midtronics Inc. www.midtronics.com	100
Municipal Electric Association Reciprocal Insurance Exchange	315
Municipal World www.municipalworld.com	313
Munters Inc. www.munters.com	203
Natural Resources Canada www.nrcan.gc.ca	600
North Star Structural Contractors Ltd. www.osmose.com	510
Oakville Hydro Corporation www.oakvillehydro.com	206
Olameter Inc. www.olameter.com	202
Ontario Power Generation www.opg.com	213
Performance Apparel Canada www.marvholland.com	200
Solution 105 Consulting Ltd. www.solution105.com	108
techniCAL www.technical-sys.com	700
Utilismart Corporation www.utilsmartcorp.com	705
Xebec Imaging Services Inc. www.xebec.ca	303

Floor Plan

Metro Toronto Convention Centre South Building HALL G

For more information visit EnerCom at: www.enercom.to or call: (416) 512-1215, Extension 226



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Keynote Speaker

General H. Norman Schwarzkopf

Sunday, June 1, 2003, 1:00 pm

Special Event Concert

Randy Travis

Monday, June 2, 2003, Ryman Auditorium, 9:00 pm

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By:

John Pointon
Director of Sales & Marketing
OmniSTAR

Recent Developments in the GPS/DGPS Environment

Introduction

Developments in GPS (the Global Positioning System) and DGPS (Differential GPS) over the last few years have greatly changed the options for geo-location procedures in the survey and utilities mapping industry. Full availability of GPS signal and varied choices for differential corrections, together with competitive pricing for good quality DGPS receivers and data logging equipment, mean that high accuracy real time positioning is available for relatively low cost. In addition, due to advances in technology and changing government initiatives, the choices available are continuously evolving. Recent developments have also brought about significant increases in available accuracy at reduced cost. This article addresses some of the latest developments in the field of GPS/DGPS and the options available to system users.

Differential GPS and the Removal of SA

Outside a brief period in the early 1990's during Desert Storm the accuracy available to civilian and other non-authorized users of GPS had been deliberately degraded by the United States Department of Defense (US DOD) for reasons of national security. This accuracy degradation, known as Selective Availability or SA, limited the horizontal positioning accuracy of a stand alone GPS for most users to approximately +/- 100 meters. To overcome the effects of SA differential techniques were applied (DGPS). DGPS involved the use of GPS receivers placed at known locations to measure systematic errors (of which SA was the greatest). These error measurements could then be applied to the position calculations for unknown locations to derive a much more accurate result. Differential corrections could be applied using post processing techniques or in real time if an adequate data link existed between the reference station(s) and the user. Using differential techniques and good quality DGPS instruments the effects of SA could effectively be removed resulting in horizontal accuracies of better than +/- 1 meter.

Virtually all GIS and utilities mapping users require accuracy of better than +/- 100 meters and the use of Differential techniques was therefore a necessity.

On May 1st 2000 the US DOD removed SA. This was the single largest source of error in GPS positioning so the first reaction of many GPS users was: "Do I still need to use Differential Techniques?".

Subsequent measurements, after the removal of SA, indicate that horizontal accuracies of approximately +/- 7-10 meters can be achieved with a good quality GPS receiver. Another important but potentially misleading change is a considerable improvement in short term positioning stability. This can lead to overestimates of accuracy if only short period data sets are used for analysis.

Results from lower quality receivers, such as hand held devices, are significantly less good. Interestingly, stand-alone performance differences between receivers now SA is off are greater than the variations in differential performance prior to the removal of SA.

Despite this significant improvement in stand-alone accuracy, it still does not meet the requirements of most GIS users, therefore differential techniques continue to be used for most applications.

Although the removal of SA has not changed the need for differential corrections it has made the use of real time DGPS more robust. With SA on, systematic errors changed rapidly and differential corrections had to be updated continuously. If a new differential correction was not received within, say, 30 seconds, then the position degraded very rapidly to non-differential quality. With SA switched off the rate of change of GPS errors (now largely caused by atmospheric conditions) is much slower. This means that, provided sufficient GPS satellites remain in view, a good position may be calculated for several minutes without the need for frequent differential updates. In areas where differential signal blockage occurs, such as under tree canopy or in downtown "canyons", the removal of SA has meant that this blockage is less of a problem. One good differential correction can be used for several minutes without a significant degradation in positioning accuracy, provided enough GPS satellites remain available.

Differential Correction Sources – WAAS, Beacon, Commercial

Assuming horizontal accuracies of better than +/- 8 meters are required then differential corrections are still needed to remove the errors in GPS caused by atmospheric effects and system perturbations.

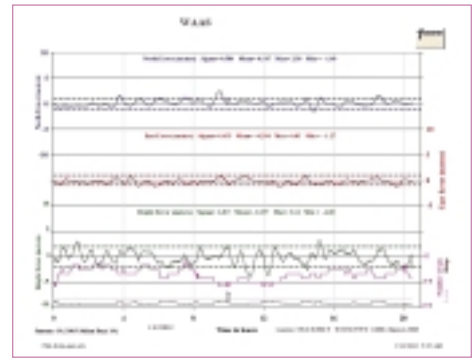
The main choices are: (i) provide your own differential signal (by buying a radio data link and another GPS receiver as a reference unit) or (ii) use a signal provided by a third party. Most DGPS users are now using signals provided by a third party as these are widely available and minimize the capital expenditure and logistic support required by a user owned system. 'Free' tax payer funded systems are attractive due to the lack of a user fee, but their performance and reliability do not match those of the commercial providers. To summarize, here is a list of the pros and cons of the various methods:

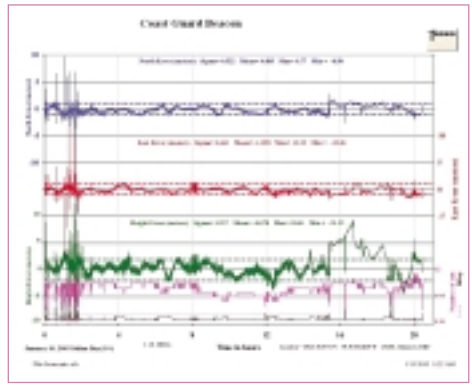
	Pros	Cons
Own signal	You have control Potential for maximum accuracy	Capital Investment Logistic support More to go wrong
Tower Network	Potential for maximum accuracy Local support	Limited coverage Not widely available
FM Sideband	Potential for maximum accuracy Lightweight Relatively low up front cost	Limited coverage Not widely available
Coast Guard	Relatively low up front cost 'Free' signal	Limited coverage Variable Accuracy Weather Interference No guarantees
WAAS	Wide area of Coverage Relatively low up front cost 'Free' signal	Variable Accuracy No guarantees Questionable Future
Commercial Satellite Signal	Maximum Accuracy Global Coverage Reliable signal Customer Support New High Performance Options	Annual Subscription Fee

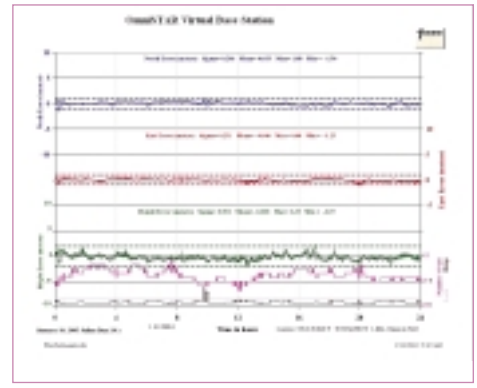
Tower networks and FM sideband providers are virtually non-existent having been rendered uncompetitive by the tax-payer funded systems. WAAS the Wide Area Augmentation System - is currently the greatest 'unknown' in the mix. In addition to being 'free' (although it has already cost the American taxpayer well over 1 billion dollars with on-going costs of nearly $100M a year!) its great advantage is the wide area of coverage. Being satellite delivered, this is expected to equal that already provided by the commercial satellite suppliers. However, accuracy and stability tests so far indicate that it does not provide the same levels of performance as those achieved by the commercial suppliers and, due to satellite selection, coverage is less good at Northern latitudes. Horizontal accuracy using a good commercial satellite service (such as OmniSTAR) and a good DGPS receiver should be consistently sub meter (ie: < +/- 1 meter 3 sigma). Although short term stability with WAAS appears to be quite good there may be times during the day when it can be over 2 meters off location for extended periods.

So, as always, the user has to decide how critical the job specifications are and select the system to meet these specs. For non-critical work a government supplied differential service and relatively low cost handheld GPS receiver could be more than adequate. For projects where the specifications require maximum absolute and repeatable accuracy then a high grade GPS receiver coupled with a commercial differential correction service would be the best choice.

The following charts indicate the different levels of performance between coast guard beacon (at ~40 miles), WAAS (on a relatively good day) and commercial satellite differential (the coast guard signal was affected by thunderstorm activity for part of the 24 hour period).







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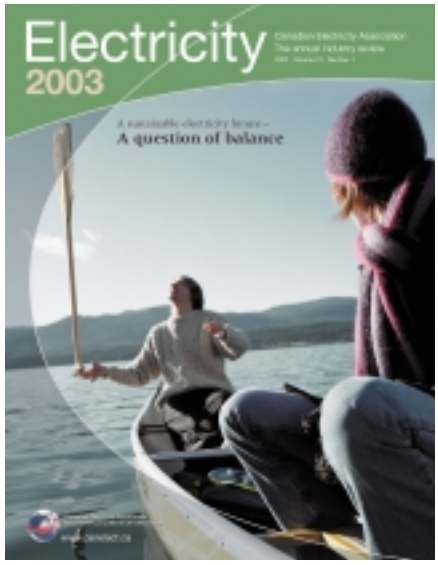

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- Company reviews and forecasts by 23 of Canada's most prominent utilities.

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Canadian Electricity Association
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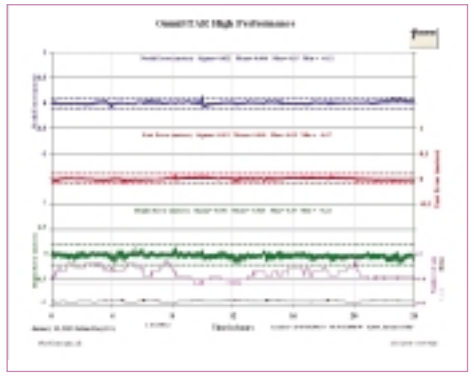
Higher Accuracy Options in Real Time DGPS

During the last quarter of 2002 options for even higher precision differential services have become commercially available. Some of these services, when combined with a suitable dual frequency DGPS L1/L2 receiver, can provide horizontal positioning accuracies of < +/- 10 cms.

This latest development represents something of a breakthrough in real time positioning techniques because hitherto it has been necessary to use expensive and challenging RTK techniques to reach these levels of accuracy.



The next plot indicates the significantly improved accuracy available from a dual frequency wide area solution (note the different scale):

Hardware Choices

Another important choice for the DGPS user is type of hardware. The two main categories are: relatively inexpensive hand held devices which nonetheless have built-in data logging and processing capabilities, or more expensive instruments which require a backpack.

Again, the key question is the required measurement specifications for the work. Handheld devices, although inexpensive, easy to use, and amazingly sophisticated for the size and price, are inevitably limited in the level of positioning accuracy they can achieve due to engineering compromises made to reduce size and weight. Backpack units, with separate high quality antennas, and designed for maximum accuracy, deliver much greater accuracy but are more expensive and more complex to operate.

Generally speaking the horizontal accuracy of hand held receivers is in the +/- 3 – 5 meter range, whereas back pack units can provide consistent sub meter results (with a good differential correction).

Summary

Recent developments, such as the removal of SA and the introduction of WAAS, together with the availability of high accuracy wide area solutions from commercial suppliers, mean that careful consideration must be given to equipment and service performance to ensure that systems deployed are sufficient to meet job requirements. ■

GLOBAL ESMO 2003
The Power is in Your Hands

Welcome Address

Sarah Rogers, Vice President Transmission, Florida Power Corp., will deliver the welcome address at ESMO 2003. Rogers is responsible for 4,400 miles of transmission line serving 1.4 million customers within 32 Florida counties, controlling a budget of $83 million.

Rogers obtained a Bachelor of Science degree in electrical engineering from San Diego State University in 1983, and received her Masters of Business Administration from the Fuqua School of Business at Duke University in 1990.

Rogers previously held the position of Vice President of Transmission for Progress Energy Carolinas. Prior t2o that she was Manager-Telecommunications Support in the Telecommunications Department. From June 1995 to June 1997, Rogers was Manager of the Northern Transmission Area, and in July 1997, she was promoted to Vice President-Transmission. Rogers is a registered professional engineer in the states of Florida and North Carolina and a member of the Edison Electric Institute, serving on the Transmission Committee.

Schedule of Events 2003

Sunday, April 6
— Orange County Convention Center

1:00 p.m. – 7:00 p.m.
Attendee Registration

5:00 p.m. – 7:00 p.m.
Welcome Reception (Rosen Centre Hotel)

Monday, April 7
— Orange County Convention Center

7:00 a.m. – 6:00 p.m.
Conference Registration

7:00 a.m. – 8:00 a.m.
Continental Breakfast

8:00 a.m. – 9:30 a.m.
Opening General Session

9:30 a.m. – 6:30 p.m.
Indoor Exhibit Floor Open

10:30 a.m. – 12:30 p.m.
Technical Papers/Panel Sessions

12:30 p.m. – 2:30 p.m.
Buffet Luncheon on the Show Floor

2:30 p.m. – 4:30 p.m.
Technical Papers/Panel Sessions

5:30 p.m. – 6:30 p.m.
Cocktail Reception on the Show Floor

Tuesday, April 8
— Progress Energy Central Florida Substation

7:00 a.m. – 4:00 p.m.
Conference Registration
(Orange County Convention Center)

8:00 a.m. – 9:30 a.m.
Continental Breakfast

8:30 a.m. – 4:00 p.m.
Outdoor Exhibits & Demonstrations Open

All Day
Indoor Exhibit Floor Closed

Wednesday, April 9
— Orange County Convention Center

7:00 a.m. – 5:30 p.m.
Conference Registration

7:00 a.m. – 8:00 a.m.
Continental Breakfast

9:30 a.m. – 4:00 p.m.
Indoor Exhibit Floor Open

11:30 a.m. – 12:30 p.m.
Buffet Luncheon on the Show Floor

12:30 p.m. – 2:30 p.m.
Technical Papers/Panel Sessions

3:30 p.m. – 5:30 p.m.
Technical Papers/Panel Sessions

4:00 p.m.
Indoor Exhibitor Floor Closed

7:00 p.m. – 10:00 p.m.
Conference Reception & Banquet
(Rosen Centre Hotel)

Thursday, April 10
— Progress Energy Central Florida Substation

8:00 a.m. – 9:30 a.m.
Continental Breakfast

8:30 a.m. – 3:00 p.m.
Outdoor Exhibits & Demonstrations Open

All Day
Indoor Exhibit Floor Closed

Exhibitors by Company

Company	Booth#
Aerotec	520
AIR2, LLC	332
Alcoa Conductor Accessories	220
Altec Industries Inc.	201
Bashlin Industries	104
Bronto Skylift	118
Buckingham Mfg. Co. Inc.	134
Canadian Helicopters Ltd.	235
Compass Equip. Leasing Inc.	614
Condux International Inc.	501
DCD Design & Mfg. Ltd.	634
Demark	222
Deutsch Metal Components	418
Dominion Technical Solutions Inc.	525
DTE Energy Technologies	216
DuPont Personal Protection	323
Electromark	425
ERICO Inc.	234
ESCI	733
Estex Manufacturing Co. Inc.	533
Euclid Garment Mfg. Co.	106
Gary Guard Inc.	320
Genics Inc.	618
Harger Lightning & Grounding	335
Hastings Hot Line Tools	714
Haverfield Corporation	301
HD Electric Co.	314
Hendrix Wire & Cable	534
High Voltage Inc.	718
The Homac Companies	100
HOT/SHOT Infrared Inspections Inc.	103
Hubbell Power Systems	401
Hughes Brothers Inc.	221
Huskie Tools	324
Hydro-Quebec TransEnergie	516
Implo Technologies	708
IRBY Construction Company	218
Jelco	709
Keeler & Long PPG	108
Kinectrics	414
K-Line Insulators Ltd.	200
Kunz Glove Co.	123
Laminated Wood Systems	515
Lewis Manufacturing Co.	435
Lindsey Manufacturing Co.	205
L.P. Royer Inc.	434
Maslonka & Associates Inc.	509
MasTec Inc.	422
Midsun Group	721
NASCO Industries Inc.	635
Ndb Technologie Inc.	119
Ofil Ltd.	116
Optimal Technology /AVCAN Systems	232
Osmose	600
Phenix Technologies Inc.	419
Philips Fitel	208
Phoenix Manufacturing Ltd.	334
Plastic Techniques Inc.	315
Preformed Line Products	115
Progress Energy	719
Public Utilities Maintenance Inc.	112
Quanta Services	609
Radiodetection	120
Ratcliff Hoist Co. Inc.	315
Red Simpson Inc.	734
Ripley Tools	215
Ropes That Rescue	132
RotorWorks	114
Sabre Tubular Structures	224
Sagatex North America	321
Salisbury	209
S.D.P. Manufacturing Inc.	110
Sediver	501
Sherman & Reilly Inc.	101
Sievert Industries	420
SOLOCO	421
Speed Systems Inc.	723
Steel Grip Inc.	319
Sterling Ropes	132
SVE Sales	621
Team Fenex	109
Terex Utilities	423
Tesmec S.P.A.	501
Thiermann Industries	322
Thomas & Betts	619
Time Manufacturing Co.	223
Transmission & Distribution World Magazine	615
TSE International Inc.	305
Tyco Electronics	309
Tyndale	133
Unique Concepts Inc.	433
USA Airmobile Inc.	535
Uticom Systems Inc.	519
Utility Equipment Leasing Corp.	735
Utility Structural Systems	135
The VON Corp.	608
Wacker Silicones	102
Waukesha Electric	720
White Rubber	415
Wire Dynamix	725

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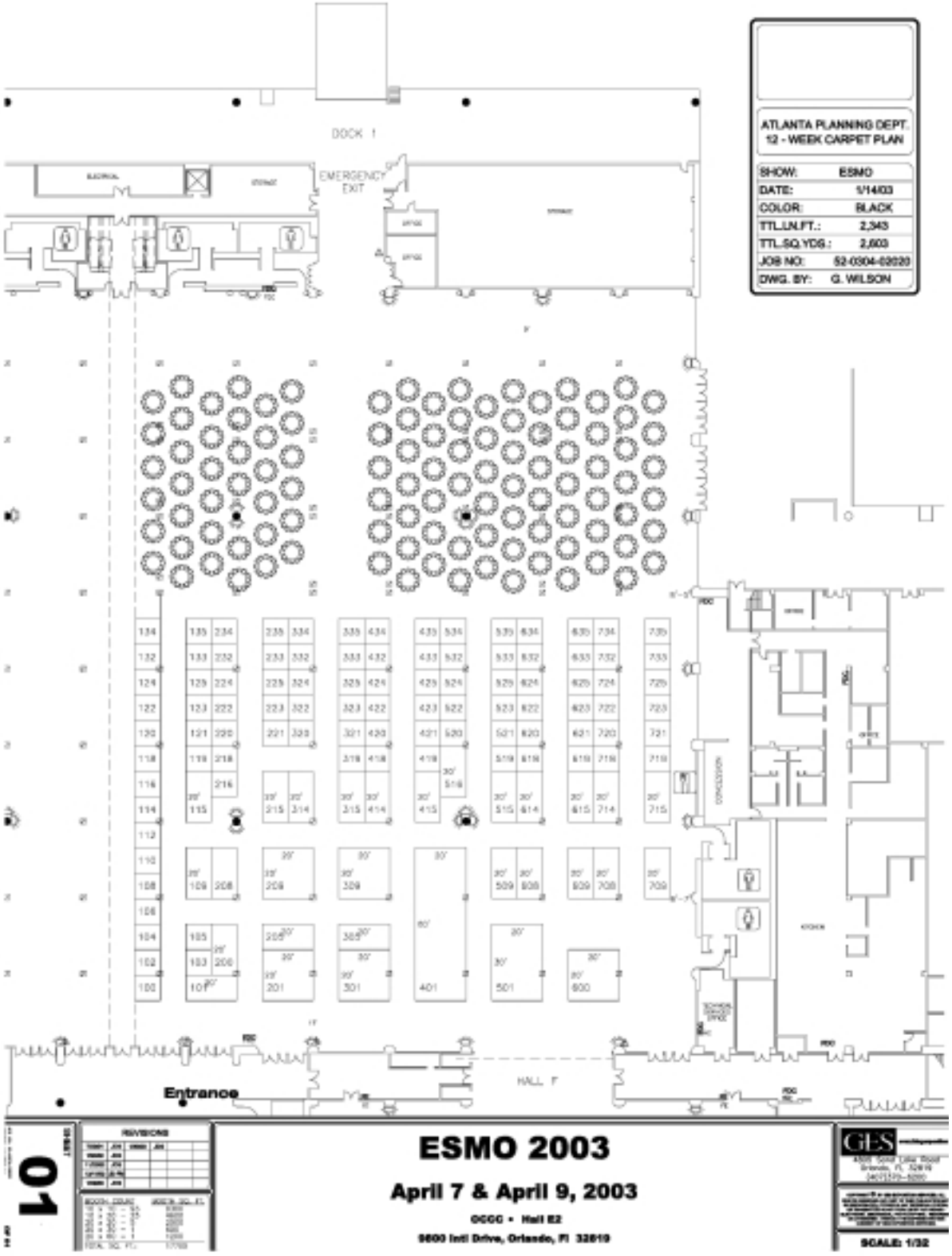
Floor Plan



By:
Chuck Drinnan
Director of GIS Applications
LogicaCMG's energy and utilities

From Checkers to Chess – Enterprise GIS – The High Stakes Solutions for Utilities

CHANGING UTILITY BUSINESS MODELS

Comparing the utility industry ten years ago to the industry today is like comparing checkers to chess. Not only are the rules different and the pieces more powerful but also the shapes of the players have changed. Five years ago vertically integrated utilities moved in prescribed, straightforward manners over a regulated environment; today, the industry having experienced the changes caused by deregulation has metamorphosed through mergers and acquisitions into larger players that often operate globally. Some large utilities have treated components of the old vertical utilities almost as pawns to be traded in an effort to develop even more powerful companies. Increasingly utilities are measured using new and ever changing financial models. The shapes of the utility companies have changed until some offer only specific services and others no longer consider themselves utilities. Many utility players seek opportunities to move the length of the global board.

As if the California crisis and 9/11 were not enough for the utility industry, 2002 has brought the aftermath of Enron, the painful dismantling of the utility trading industry and financial market uncertainty. The bright glare of aggressive companies with inflated stock valuations riding the wave of deregulation through mergers and acquisitions has dimmed and many utilities are back to providing reliable, cost effective service to their relieved customers – what many would say is the utility core business.

De-regulation has left a permanent mark – focus on providing business value. The utility must control costs, increase asset life-cycle value, and provide world-class customer service. While five years ago the industry said these same words, today the industry actually has the powerful tools and the experience to meet these requirements.

What Will Utilities Do?

I believe we will see three utility tiers emerge this year in the systems world for the Distribution utility industry. First, some very aggressive utilities will take this time to become even more competitive. They have an objective to be the "best" distribution company in the world and that objective has not changed – in fact in tough financial times it is even stronger. "When times are tough, the tough get going." These companies are continuing to drive costs down and improve customer service – objectives they see as complimentary not contrasting.

The second tier is for utilities to re-trench and assimilate the technology they already have. These utilities are focusing on assimilating the technology they have been developing and integrating their systems and processes to increase the business and IT benefits. The business impact of GIS, Work Management (WMS), Asset Management (AMS), Financial Systems, and Decision Support Systems is magnified if the systems form an enterprise wide solution that provides appropriate users access at the desktop and in the field, where the work is done. These companies will make system investments to improve their environments but the investments may be more tactical than strategic. Perhaps they will make a major upgrade to a new system, purchase system capability to meet new compliance standards, or fill out their system repertoire. These utilities will not stand still.

The third tier of utilities will take this environment of uncertain business models and uncertain financial times and conserve what they have. Their system and IT expenditures will be scaled down and they will "stand pat".

The financial market and regulatory organizations will be even harder for them and when the market turns up they may be the cheap targets of yet another round of acquisitions. The regulatory environment will be rewarding business value through performance-based rates and increased service standards and these companies will be further behind compared to more aggressive companies.

Aggressive Approaches

Aggressive utilities have already cut costs and reduced staffs. Typically these companies are the result of mergers and acquisitions and have cultural and business process issues to overcome. They are driving to become one utility with one business practice – and the practice must be the most cost and service effective. This leads to integrated enterprise systems and new ways to use these systems.

The utility growth trend for these utilities is the implementation of new applications with different views of the application's purpose and requirements. For example, reduce the cost of construction materials by optimizing the design of new construction; use the asset data you have been capturing and change your processes and standards; manage the outage event – don't let it manage you. The emphasis will be to enable the field not with copies of desktop capability but with systems designed for the field. Regulators are demanding the retention of inspection results for ten years – new systems will not only retain the data but they will also use the data to make better decisions. The paradigms for each of these applications are changing.

Work is Work – Resources are Resources

As the capability of WMS systems increases, more and more work is being managed through the WMS system. Managing all work in a consistent manner assures that all costs are captured, all the other systems are updated appropriately, and enables using joint crews. By treating the company's crews as a total resource pool and scheduling the crews through a central process, an entire tier of management structure can be removed and the crews will be scheduled more effectively, appointments will be met, and travel time optimized. Utilities that have embraced these technologies have reduced their crews and vehicles by significant percentages. These benefits are fully realized when the systems and processes are integrated over the enterprise.

Managing Company Assets Effectively Using Asset Knowledge

Knowledge of the utility's facilities and physical network and dissemination and analysis of that knowledge is a fundamental business requirement of the utility. How can the Distribution Company reduce cost without knowing their facility assets and their status, the processes that have been performed on the assets, and the associated costs? However, knowing this information is not enough. Knowledge comes from the act of understanding and interpreting the asset information.

The value of an asset is not merely the costs of purchase and installation depreciated over time. The value of the asset includes the knowledge of the full cost of the asset through its useful life and the status and condition of the asset. It also includes the knowledge of how the asset is, has been, and could be used in the network so that its use can be optimized and its useful life extended. The value of the asset should include an evaluation of the importance of the asset to delivery of energy and system reliability. When a utility's assets are evaluated (during a merger or acquisition for example) the utility's knowledge of the asset and how the asset is used are considered as well as the book value of the asset.

EEI **Annual Convention/Expo**

Edison Electric Institute joined by Canadian Electricity Association

Hilton Hawaiian Village, Honolulu • June 1-4, 2003

Charting the Future Course

Hawaii

Never before has the energy industry faced such serious challenges. In 2003, there will be decision-making on several critical issues:

- system reliability and infrastructure protection;
- oversight of finances and governance;
- Federal and state regulatory initiatives on market structure;
- and national energy and environmental legislation.

How well we understand and cope with these issues will determine the success of both your company and the industry. Attend EEI's Annual Convention/Expo and help demonstrate Power by Association℠.

This event is designed to:

- create business and networking opportunities;
- provide you with new ideas through Executive Forums;
- give you insight on critical issues by facilitating exchanges with industry experts;
- and showcase the latest technologies and services from top industry suppliers.

Keynote Speakers include:

Lord John Browne – Chairman of BP, the holding company of one of the world's largest petroleum and petrochemicals groups.

Dewitt Jones – a world-class photojournalist with National Geographic and an Academy Award-nominated director.

Visit www.eei.org/2003 for more details and to register.

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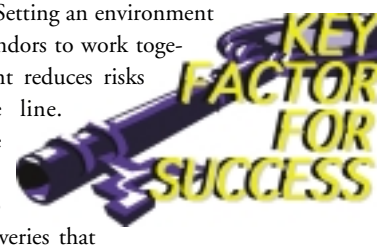
It Takes Time and Diligence

Utilities, that have implemented GIS, WMS and AMS systems several years ago, are beginning to accumulate the information necessary to make reasoned decisions. They can determine asset life cycle costs and define material standards not based on the lowest purchase price but on the best value. They can prolong the productive life of the assets through effective preventative maintenance strategies. They can examine the performance of their crews and modify their procedures to reduce costs, allocate resources based on actual needs, and understand how to manage their maintenance expenditures. With the knowledge of the cost and duration of each process step, the informed manager can determine the bottlenecks, tweak the processes, and reduce costs while improving service and reliability.

Acheving Project Benefits Quickly by Aggressive System Integration

In today's environment, enterprise wide systems must be implemented rapidly and within budget. In the utility environment where corporate change is likely to happen within the next two years, projects that require two or more years are unacceptable to executive management. In fact projects that don't provide measurable progress in six months may not survive next years budget cutbacks.

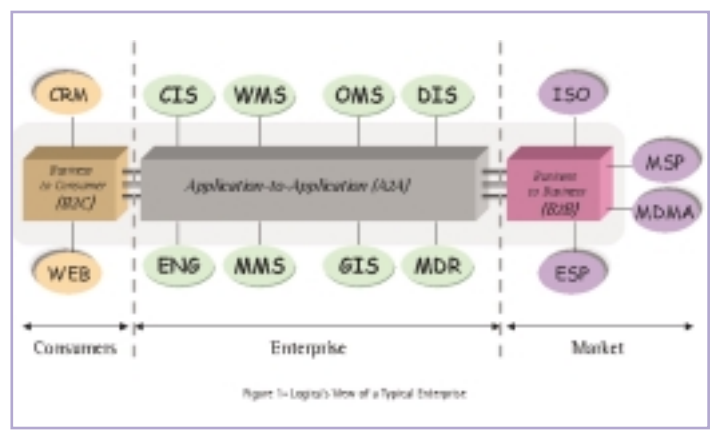
Designing and implementing systems and converting data concurrently reduce project timelines by years. Setting an environment that promotes (in fact expects) vendors to work together in a cooperative environment reduces risks and further reduces the time line. Without careful control of change requests and scope creep, your project is probably doomed to failure. Planning incremental deliveries that offer benefits encourages continued project support.



Many of these approaches require taking short-term risks that favor getting the project done now rather than planning the project for years while technological changes continue to impact the plans. It is often less expensive to fix minor deficiencies after the system is developed and implemented than designing unnecessary complexity and extended schedules into the system up-front.

Recognizing the need for system integration capabilities whether in-house or with an experienced vendor is critical to project success. You have to plan for success. System integration and effective project management are not enough – utilities should use the latest in IT standards and new more effective integration capabilities.

Designing Flexible/Adaptable Systems and System Architectures for an Uncertain Future



ESMO 2003 is an officially sanctioned IEEE/PES conference

GLOBAL ESMO 2003

The Power is in Your Hands

Hosted by: Progress Energy

April 6-10, 2003
Orlando, Florida

The 10th International Conference on Transmission & Distribution Construction, Operation and Live-Line Maintenance

Mark your calendar today and make plans now to join 2000 utility professionals, representing more than 40 countries, from April 6-10, 2003 in Orlando, Florida for the ESMO 2003 conference.

ESMO 2003 is devoted to the practical, hands-on aspects of construction, operation, maintenance and safety of overhead and underground transmission and distribution lines, including substations. The conference program spans four days, featuring two days of outdoor field demonstrations/exhibits and a two-day technical program combined with an indoor exhibit area. Attendees will gain the knowledge and expertise required to effectively manage the world's power delivery systems.

Technical Program

Through individual paper sessions and group panel discussions, the ESMO 2003 technical program will highlight the latest advances in the construction, operation and maintenance of power-delivery systems. The conference has attracted 27 declaration of intent forms for individual paper presentations and 18 panel sessions have been organized by leading industry experts.

Indoor and Outdoor Exhibits

At ESMO 2003, attendees will have the opportunity to examine new products and services in an indoor and outdoor setting. This unique format provides plenty of time for attendees to thoroughly examine the products and services that can improve system efficiency and reduce costs.

Outdoor Field Demonstrations

The outdoor demonstration area sets ESMO apart from other conferences in the industry. At the outdoor site attendees see the latest work practices and procedures demonstrated up close and in action. The outdoor program will feature live-line demonstrations, construction techniques, safety procedures, operations activities, testing procedures, right-of-way management techniques and equipment, a heavy equipment display area and much more. Twenty-five companies are planning to participate in the outdoor demonstration program.

For a complete attendee brochure or additional information please contact
Kim Good • 913-967-1865
or visit
www.esmoconference.com

Exhibit Information
Joyce Nolan (companies A-G) 610-701-9993
Tracy Smith (companies H-O) 913-967-1324
Susan Schaefer (companies P-Z) 484-478-0154

Outdoor Demonstration Information
Michael Wright • 407-942-9255

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As I write this, I am aware of more than ten utilities that are evaluating or implementing a new GIS because through merger or acquisition they now have GIS capabilities from different vendors. Many of the same utilities have different WMS and OMS systems.

As the pace of technology innovation accelerates significant new releases of all the component systems occur frequently. Some of these new systems require significant effort to embrace the new technology that the utility wants. In this environment, utilities are seeking system solutions that insulate their mission critical systems from the impact of constant change while allowing the utility to embrace the latest technology. They want tightly integrated user environments with loosely coupled system approaches.

Vendors are moving this technology forward to a service-oriented architecture centered on defined business processes. This service-oriented architecture includes the ability to not only monitor the performance of the integration software but also to monitor and manage critical processes and functions.

Enterprise Application Integration (EAI) technology provides an infrastructure to deliver new strategic business solutions by combining existing applications with new systems, custom applications, and off - the - shelf applications. The key to EAI is message driven or event driven solutions that enable integration of disparate applications through loosely coupled messaging approaches. Today's point-to-point interfaces increase in number and complexity as new technology is implemented, until rapid implementation of changes and new technology becomes increasingly more difficult. The EAI architectural approach applies a component-based methodology where messaging and events are the mediums that bind all the enterprise level applications and data irrespective of their platform or architecture. This is a technological approach that reduces risk and enables rapid implementation in a fast moving, changing environment – today's utility market. The EAI industry is changing rapidly – if you took a peak at the industry a couple of years ago, look at it again because there are more real installations and the industry has adapted to these experiences.

As the scope of the GIS increases to provide enterprise access and services, it becomes increasingly more important to know how to implement the interfaces and integration effectively. The industry trend today is to define common business processes across multiple applications and business requirements and to relate them to the way the applications share data and functional capability. Some of these applications may serve the data over the web to customers outside the enterprise. The MultiSpeak initiative is an example of the need for standardization based on new

EAI technology for the smaller utility. Major system integrators are taking similar approaches for the large investor owned utilities.

EAI technology has suggested an inter system and inter enterprise messaging capability that provides business functions and data to a variety of systems and users without requiring the users to understand the specifics of the underling systems and data. The messaging capability is defined in a manner that isolates the details of a specific system from the user and also from the IT developer. Through EAI, a loosely coupled environment can be implemented that provides the user with tight integration but provides the IT professional with an easy expansion path as systems and process change. The IT professionals are also enabled to share this data with new partners and new enterprises. Systems defined based on business processes and modern integration technology can be quickly expanded to meet new regulatory requirements and new mergers. This leads to increased security requirements to provide access to all appropriate users. With the pace of technology ever increasing, systems that are highly configurable and based on the latest IT standards and processes offer the best value over years of productive use.

Conclusions

Enterprise systems including GIS, WMS, AMS, and OMS integrated with modern integration techniques offer increased benefits and enable the entire utility from the desktop to the field to be more productive. They manage resources effectively and increase the span of control of the company's managers. They provide the knowledge for informed users to make decisions that reduce costs and increase system reliability.

As the financial markets improve, aggressive utilities that implement best practices and make the commitment to be the best in the industry will emerge as the strong companies of this decade. They will lead the industry in adopting new approaches to minimize cost while maintaining customer service. Integrated enterprise wide systems will be the cornerstones of their effective systems. ■

About the Author

Chuck Drinnan is Director of GIS Applications for LogicaCMG's energy and utilities division in North America. He has 29 years of experience in the GIS and utility industries. LogicaCMG provides IT solutions, including systems integration, consulting, products and services. Chuck can be reach at chuck.drinnan@logicacmg.com.

Show Coverage 2003

The President's Message

Welcome to Doble's 70th Annual International Conference. This premier event brings together more than eleven hundred electric power systems engineers, managers and executives. Networking, sharing operating experiences and solutions arising from deregulation and new regulatory demands, these activities all complement the formal presentations and discussions of this unique event.

Topics range from the very basic and practical needs of locating sources of repair components and loans of spare apparatus...to presentations of the newest diagnostic techniques—tools that help identify potential malfunction in advance of apparatus failure.

Now, developing world-class Asset Management practices has become the newest Conference topic. These efforts recognize the multiple financial and operational drivers governing decisions to:

- "Keep in service"
- "Remove from service"
- "Replace as soon as possible"
- "Redesign the system node"

Asset Management is of such significance to the industry that our keynote speaker is Deputy Assistant Secretary, Bruce Blakeman. Mr. Blakeman is charged with the implementation of Vice President Cheney's National Energy Policy. Blakeman commissioned the creation of the Energy Team, which ensures involvement of pertinent federal agencies, as the processes develop. Mr. Blakeman's presentation focuses on needs for new investment in power systems and management of existing infrastructure. In addition, the seventy formal presentations and many round table discussions are complemented by an Industry Expo, numbering more than fifty companies. Clients can meet major suppliers and learn of their newest technological developments.

Again, my personal welcome to the 70th Doble Client Conference. Thank you for your active participation.

Doble's Opening Session

The keynote address at this year's Conference will be followed by a special Opening Session. This session includes presentations and a panel discussion on the topic "Management of Asset Performance as Part of System Integrity in a Deregulated Business." The Opening Session discussions will pertain to The Cheney 2001 Energy Policy Report, which contained many powerful messages for the U.S. power industry. Many systems worldwide face a growing system demand from an aging infrastructure with little new investment. Low rates of return coupled with tight regulation of operating costs will be highlighted in this session. Representatives of the key areas will present their per spectives for new strategies – post Enron, post-California, post-Chicago. Working with the audience, the group will discuss their vision for ensuring an effective open market and lowering costs to industries, while maintaining system integrity and investor retention. We will also discuss strategies for implementing the new vision while managing and maintaining the utility's asset base, and this will be topics for the following few days of the asset management track. The focus of the 2003 Doble Client Conference will continue throughout the week with the topic of the government's energy policy and three other main subjects - substation engineering, power plant engineering and distribution and cables.

The 2003 Conference

Focusing on Asset Management

The main focus of the Doble Client Conference is the ongoing care and ownership issues of the power industry infrastructure. For the first time, Doble will expand the Conference emphasis to include seminars on Asset management. This year's focus on Asset management will reflect the recent changes that are occurring within the electric power industry. This topic is one of concern for utility senior employees and overseas, where this practice is more established. Both engineers and technical specialists will be present to discuss asset management, giving beneficial outlooks into both aspects of the story.

All of the Conference issues are discussed and reviewed during technical seminars by Doble clients and tutorials given by specialists. Participants at these sessions include utility asset managers, operations and maintenance departments and major power equipment manufacturers. The Doble Client Conference focuses on four different areas of the electric power industry. The main topics discussed at the Conference fall under the categories of asset management, substation maintenance, power plant engineering, and distribution and cables.

There are four main themes in the Asset management program at this year's Conference:

- The consequences of the aging infrastructure, low incentives for investment and increasing supply requirements.
- A round table discussion by senior utility representatives discussing asset management
- Justification of capital to replace aging assets and methods to assess the effectiveness of maintenance expenditure
- Studying the effectiveness of asset management as a function—Do the gains outweigh the losses as the focus shifts from technical excellence to a unified and business concentration?

Other seminars at the 2003 Conference are devoted to Substation maintenance. Topics cover equipment performance, failures, life assessment and diagnostics. Participants will have the chance to discuss their methods, experiences and philosophies of testing and life assessment and case studies, illustrating the effectiveness of their approach.

Several papers on frequency response testing of transformers will also be given at the 2003 Conference. Sweep Frequency Response Analysis is one of the newest diagnostic tools, used to detect physical distortion in transformers, frequently caused by short-circuit stress in removal or damage in transit. Recent field results will be presented. The rotating machinery committee will be reviewing diagnostics including partial discharge. They will be discussing how rotating machines from different manufacturers and vintage contrast in their responses.

APDA CABLE

Condition Monitoring of Medium Voltage Cable Terminations and Cable Joints

APDA - Acoustic Partial Discharge Analyzer

- Check your cable accessory without disturbing normal service operation.
- Detect defects in cable accessory before breakdown and obtain optimum economic condition based maintenance and renewal program.
- Get quality assurance of new terminations during commissioning.

The acoustic technique used in the APDA is widely known and accepted as a diagnostic tool for detection of partial discharges

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Over the years Doble and its clients developed these maintenance practices.

The practices have evolved over time and are still in use today. Below are some of the important developments:

Insulation Power Factor Field Testing
Doble Engineering 1934

Circuit Breaker Contact Resistance Tests
Detroit Edison 1938

Circuit Breaker Timing/ Motion Analysis
Cincinnati Gas & Electric 1938

Interfacial tension Test for Oil Oxidation Products
Union Electric Co. 1943

Transformer Turns-Ratio Measurement
Alabama Power 1944

VDE-Gap Oil Dielectric Strength Test
General Electric Co. 1957

Transformer Incipient Fault Detection (TCG)
Pennsylvania Transformer Div. 1960

Winding Excitation—Current Measurement
Doble Engineering 1967

Infrared-Thermographic Scanning
Public Service Indiana 1969

Low-Voltage Impulse Testing of Power Transformers
Bonneville Power Administration 1969

Transformer Incipient Fault Detection
Hydro-Quebec 1971

Automated Insulation Power-Factor Testing
Doble Engineering 1991

Insulating Paper Degradation Product Analysis
Potomac Electric Power Co. 1992

Circuit Breaker On-Line Monitoring
Ontario Hydro 1993

Winding Insulation Frequency Response Analysis
National Grid 1995

On-Line Diagnostic Substation Monitoring
Doble Engineering 1996

Winding Insulation Recovery Voltage Measurement
National Grid Company 1998

On-Line Diagnostic of Bushings
Doble Engineering 1996

The History of the Doble Conference

The Annual International Conference of Doble Clients

The first Client Conference took place at the office and laboratory of Doble for three days on January 18-20, 1934. Invitations were accompanied by requests that the clients bring with them their power factor test sets to the Conference for overhaul and calibration. Attendance at the first Conference totaled 20, including 12 engineers representing 11 utilities in Massachusetts, New York, Pennsylvania, and Rhode Island, all whom remain Doble Clients today.

The purpose of the Doble conference is to review and explain details of Doble testing apparatus and its operation, to describe new developments in power-factor field-testing equipment. For the first time in 70 years, Doble has invited other industry leaders and companies to join with our clients in the technical presentations and discuss new developments in insulation-testing problems, with an interchange of information and experience obtained from field tests.

Beginning in 1935, Doble invited the design engineers of the large electrical manufacturers. At the second conference, major bushing manufacturers presented information on the theory of the design and construction of bushings manufactured by then General Electric, Ohio Brass, and Westinghouse. These early presentations helped promote a better understanding of bushing construction relating to enlightened interpretation of field results and improved maintenance practices.

Participation in the Conference by power-system operators has developed over the last seventy years from the original twelve participating companies to a group now representing over 90% of the electric energy generated in North America.

Over the years, as the Doble Client Group grew, and the Conference expanded its scope, the need grew to coordinate the cooperative research on power apparatus systems, studies of operating experiences, and the dissemination of information gathered by clients. To accomplish this, the Doble Client Committees were created in 1936. Today there are 9 Committees assisting the Doble Client Group in the investigation and discussion of the problems associated with the testing and maintenance of electrical insulation and the operation of electric power apparatus.

The development of the Annual Conference Program, including the formulation of Technical Questionnaires, comes as a result of twice yearly meetings of the nine Doble Technical Committees. The Doble Client Advisory Committee represents the "technical" committees and considers matters of common interest to those committees and the client group.

The Doble technical committees are composed of representatives of electric power companies, and specifically do not include manufacturers. Manufacturers are not excluded from the Conference; Doble works closely with them to seek solutions to mutual problems. However, the Doble Conference Program (subjects for presentation, authors, and technical questionnaires) is ultimately the decision of the apparatus-users.

Conference Proceedings coupled with first hand discussions of operational problems provide a valuable source of information on which utilities prepare apparatus purchase specifications, leading to higher power system reliability. Several of the Doble Client Technical Committees have published suggested purchasing guidelines and specifications. Client engineers whose duties include the preparation of purchase specifications have found the Doble Conferences of great value because of the opportunity to obtain firsthand information on troubles experienced by other utilities with the operation of apparatus and on new developments in apparatus design.

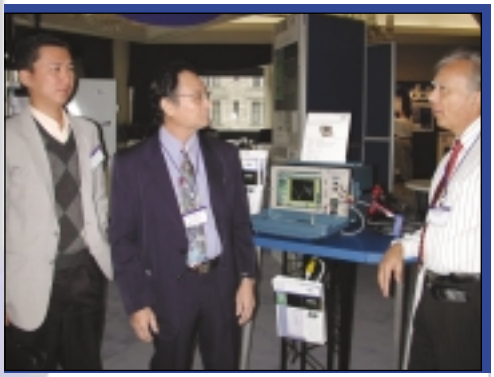
Papers and discussions presented at the Annual International Conference of Doble Clients are incorporated into the Proceedings of the Conference. These are made available to clients as part of the Doble Service Program. Taken together, these volumes of Proceedings dating back to 1934 are a rich source of information about the development of our reliable system of generation, transmission, and distribution of electric power.

While the Conference continues to grow, Doble still maintains the original mission. The Doble Conference continues to serve the electric power industry by offering an objective platform for utilities to share information about testing and maintenance practices and equipment usage.

2003 International Conference of Doble Clients

Preliminary Schedule of Events

as of February 11, 2003



Sunday April 6

Registration/Info
1:00 p.m.-6:00 p.m.
Registration & Info Desk

Social
5:00 p.m.-7:00 p.m.
Welcome Reception

7:00 p.m.- 11:00 p.m.
Hospitality Suites Open

NewComers Orientation
4:00 p.m.- 5:00 p.m.
Newcomers Orientation

Exposition
8:00 a.m.-5:00 p.m.
Exhibitors Set Up

Doble Product Pavilion
8:00 a.m.-3:00 p.m.
Doble Pavillon Set Up

3:00 p.m.-7:00 p.m.
Doble Pavillon Open

Monday April 7

Registration/Info
7:00 a.m.-6:00 p.m.
Registration & Info Desk

User Group
7:00 a.m.-8:30 a.m.
DTA User Group

Committee Meetings
7:00 a.m.-8:30 a.m.
Asset & MM • Insulating Mat

5:00 p.m.-7:00 p.m.
BIIT

Keynote Address & Opening
9:00 a.m.-10:00 a.m.
Opening and Keynote Address

TRACK 1
- Asset & Maintenance Mngmnt
10:30 a.m.-12:00 p.m.
Special Session

1:30 p.m.-5:00 p.m.
AMM Session

TRACK 2 - Substation Engineering
10:30 a.m.-12:00 p.m.
Insul Mat Session

1:30 p.m.-3:00 p.m.
IM Session

3:00 p.m.-5:00 p.m.
IM Tutorial

TRACK 2
- Substation Engineering Tutorial
10:30 a.m.-12:00 p.m.
FRA Tutorial

1:30 p.m.-5:00 p.m.
Circuit Breakers Basics Tutorial

Exposition
11:00 a.m.-2:00 p.m.
4:00 p.m.- 7:00 p.m.
Expo Open

Doble Product Pavillon
11:00 a.m.-2:00 p.m.
4:00 p.m.- 7:00 p.m.
Doble Pavillon

IEEE Subcommitee
8:00 a.m.-6:00 p.m.

Social
7:00 p.m.-11:00 p.m.
Hospitality Suites Open

Tuesday April 8

Registration/Info
7:00 a.m.-6:00 p.m.
Registration & Info Desk

Committee Meetings
7:00 a.m.-8:00 a.m.
ACCA • PAT

5:00 p.m.-7:00 p.m.
Rotating Machines • Circuit Breakers

User Group
7:00 a.m.-8:00 a.m.
SFRA

TRACK 2 - Substation Engineering
8:00 a.m.-12:00 p.m.
1:30 p.m.-5:00 p.m.
BIIT Session

TRACK 1
- Asset & Maintenance Mngmnt
8:00 a.m.-12:00 p.m.
AMM Session Continues

TRACK 1 - AMM Tutorial
1:30 p.m.- 5:00 p.m.
Asset Management Tutorial T1

TRACK 2
- Substation Engineering Tutorial
8:00 a.m.-12:00 p.m.
ACCA Tutorial T4

TRACK 3
- Powerplant Engineering Tutorial
10:00 a.m.-12:00 p.m.
R.M. Tutorial T6

TRACK 2
- Substation Engineering Tutorial
1:30 p.m.-5:00 p.m.
Power Factor Tutorial T5

Exposition
11:00 a.m.-2:00 p.m.
4:00 p.m.- 7:00 p.m.
Expo Open

Doble Product Pavillon
11:00 a.m.-2:00 p.m.
4:00 p.m.- 7:00 p.m.
Doble Pavillon

Oil Committee Mfg Dinner
6:00 p.m.- 10:00 p.m.
Oil Committee Meeting & Dinner

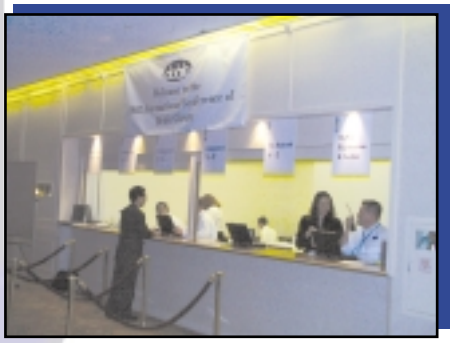
IEEE Subcommitee
8:00 a.m.-6:00 p.m.

Social
7:00 p.m.-11:00 p.m.
Hospitality Suites Open

as of February 11, 2003

2003 International Conference of Doble Clients

Preliminary Schedule of Events *Continued*



Wednesday April 9

Registration/Info
7:00 a.m.-6:00 p.m.
Registration & Info Desk

TRACK 2- Substation Engineering
8:00 a.m.-12:00 p.m.
Circuit Breakers Session
12:30 p.m.- 5:00 p.m.
Circuit Breakers & Protection

TRACK 3- Powerplant Engineering
8:00 a.m.-12:00 p.m.
12:30 p.m.- 5:00 p.m.
Rotating Machinery Session

TRACK 1- AMM Tutorials
8:00 a.m.
AMM T2
9:00 a.m.-12:00 p.m.
AMM Tutorial 3

TRACK 4- Distribution & Cables
12:30 p.m.-5:00 p.m.
Distribution & Cables Session

Exposition
11:00 a.m.-2:00 p.m.
4:00 p.m.-7:00 p.m.
Expo Open

Doble Product Pavilion
11:00 a.m.-2:00 p.m.
4:00 p.m.-7:00 p.m.
Doble Pavillon

Committee Meetings
5:00 p.m.-7:00 p.m.
Transformers

User Group
5:00 p.m.-7:00 p.m.
TRX

Social
7:00 p.m.-11:00 p.m.
Hospitality Suites Open

Thursday April 10

Registration/Info
7:00 a.m.-6:00 p.m.
Registration & Info Desk

TRACK 2 - Substation Engineering
8:00 a.m.-12:00 p.m.
12:30 p.m.- 5:00 p.m.
Transformers Session

Committee Meetings
5:00 p.m.- 7:00 p.m.
Advisory

Exposition
8:00 a.m.-4:00 p.m.
Expo Breakdown

Doble Product Pavilion
8:00 a.m.-4:00 p.m.
Group Dinner

Social
7:00 p.m.-11:00 p.m.
Group Dinner at Hotel

Friday April 11

Registration/Info
7:00 a.m.-12:00 pm.
Registration & Info Desk

TRACK 2- Substation Engineering
8:00 a.m.-12:00 p.m.
Transformers Session

Conference ends at 12:00 p.m.

KEY TO TRACKS

TRACK 1- sessions
Asset and Maintenance management

TRACK 2 - sessions
Substation Engineering

TRACK 3- sessions
Powerplant Engineering

TRACK 4- sessions
Distribution and Cables

TRACK 1- tutorials
Asset and Maintenance management

TRACK 2- tutorials
Substation Engineering

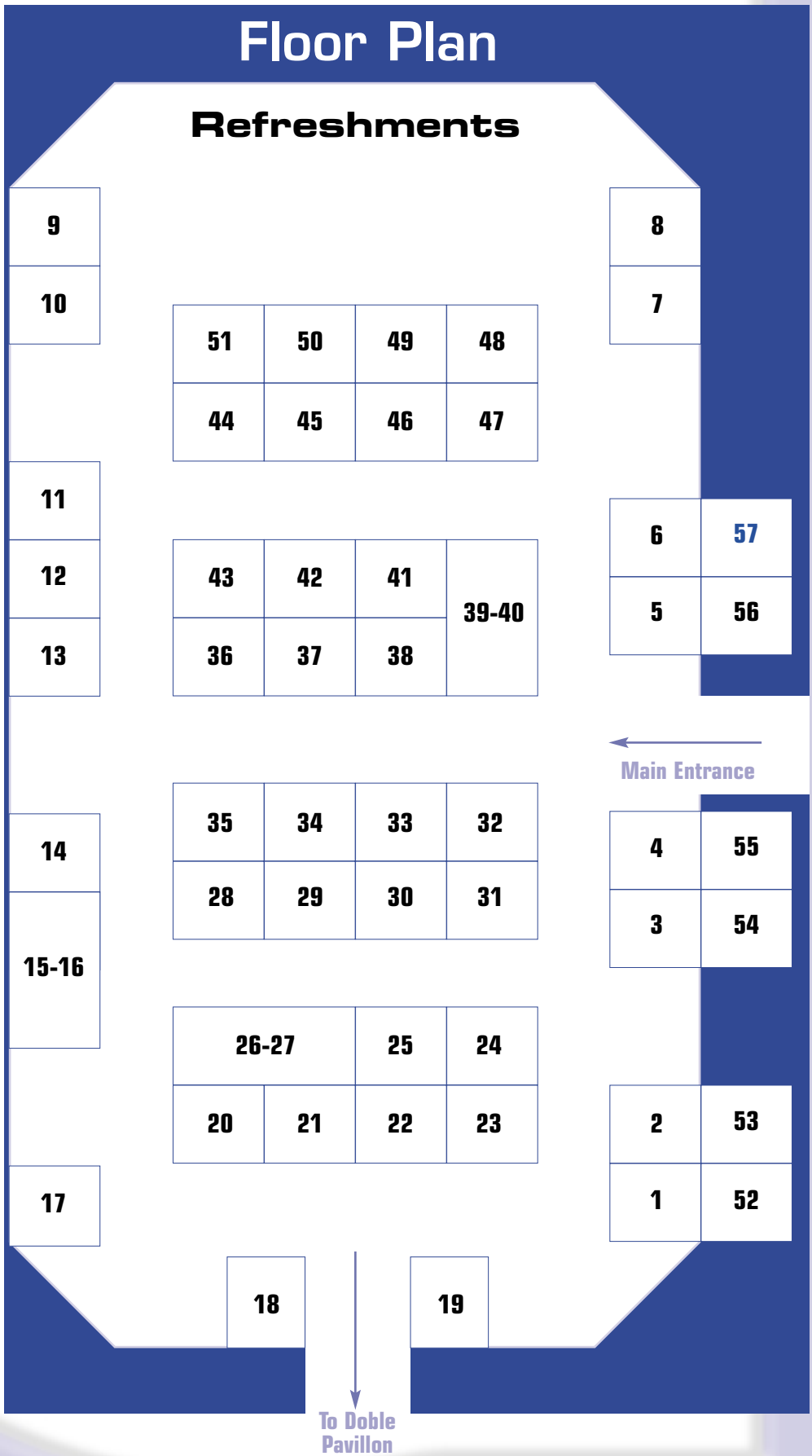
TRACK 3- tutorials
Power Plant Engineering

2003 Doble Conference - Industry Expo

Exhibitors

COMPANY	BOOTH #
ABB	6
ADWEL International Ltd.	47
Arbiter Systems Inc.	13
COLT	5
Concorde Specialty Gases Inc.	33
Cutler-Hammer	56
Delta Star, Inc.	20
Digital Inspections	37
DILO Company, Inc.	36
Doble Engineering Co. - Doble Pavilion	Staffordshire
Dymec-Dynastar	14
Dynamic Ratings Pty Ltd.	31
E Manufacturing Co., Inc.	1
Electric Energy Magazine	57
Electricity Today Magazine	52
Electro Composites Inc. Div. of ECI	32
Electroswitch	22
Enervac Corporation	41
ESB International	17
Filmax Filtration Inc.	9
Fiso Technologies	4
Flakt Coiltech	43
FLIR Systems	51
Flowserve	34
General Electric Energy /Structured Services L.P.	18-19
General Electric Industrial Systems	15-16
Midsun Group Inc.	2
Morgan Schaffer Systems	44
Normandy Machine Co.	24
Phenix Technologies, Inc	25
Power Asset Recovery Corp.	55
Qualitrol Corporation	23
Reinhausen	54
S.D. Myers, Inc.	3
Service Automation Technologies, Inc.	12
Serveron Corp.	45
Siemens Westinghouse Technical Services	30
Stephens Analytical	7
Sunbelt Transformer	11
SW Electric	53
Team Industrial Services	38
TJ/H2b Analytical Services	50
TransiNor As	48
Unifin International	35
Vacudyne Inc.	49
Velcon Filters, Inc.	10
Waukesha Electric Systems	26-27
Weidmann-ACTI Inc.	39-40

Floor Plan



By:
Terry Wildman
& Iain Ritchie
LeT Systems.

Utilities Pull Together to Design Latest Storm Management Software

It's no secret global weather patterns are changing dramatically with larger, more violent, and further reaching storms of all types and in all seasons slamming communities more frequently and randomly. On top of this, calamities such as earthquakes, terrorist attacks and fires can strike with any degree of ferocity and very often without warning. A service provider must have a reliable, lightning-fast response in place to contain damage and restore service, safety, and stability as efficiently as possible to the people and neighborhoods it serves. Add to this financial penalties and diminished user confidence in their provider for underperformance surrounding a service outage and it's easy to see why utilities are desperate for new solutions to help weather any storm.

Recently, several utilities got together in a project through the Electric Power Research Institute (EPRI) Outage Mitigation and Recovery (OMR) program to develop a new software tool to aid in their resource allocation and mutual assistance activities during recovery from major outages, as may be caused by natural and man-made disasters. The new tool was to be designed to operate in conjunction with major commercial outage management systems to add significant new functionality not available in these existing systems.

"The utility sponsors had a strong interest in participation in the project as each had in the past experienced the serious impact of large storms, high winds, heavy ice, oppressive heat or other calamities on their ability to provide electric service to their customers. They clearly knew the urgency and other issues involved in rapid recovery from major power system outages," states Frank Goodman, Technical Leader Distribution Systems for EPRI. EPRI and the utility participants provided ongoing input and review during the development of the software tool.

"We all understood that without developing the proper data base and systems to be better prepared, including 'what if' planning, we would continue to throw millions of dollars at each outage event", says Ed Kamerer, General Manager Energy Services at Con Edison of N.Y. and past Chairperson of the group. "We also realized the end product has to be affordable." Bruce Cornew, Manager Emergency Preparedness at Public Service Electric & Gas (PSE&G) and current Chairperson of the group puts it this way, "Providing more accurate restoration estimates is the number one customer satisfaction issue in our industry. This technology has to encompass the best of all features to address preparedness and response to any outage situation whatever the cause. Also, the data in a user's existing Outage Management System (OMS) must be further extrapolated to better predict when a customer or group of customers would have service restored following a major incident."

EPRI Selected LeT Systems as contractor to develop the software module under a cost sharing arrangement. LeT is a world leader in the design, development, and deployment of mission critical eBusiness based, real-time outage, network and workforce management solutions for the utility sector.

The new tool was subsequently named emPower which will be further developed, tested and deployed as part of LeT's eRespond OMS package. "I have worked very closely with LeT to offer my expertise in service restoration and am very pleased with their technical capabilities, solid reputation in the industry, and customer oriented approach to the project," remarks Bill Harper, Elkhorn Center Manager for Omaha Public Power District (OPPD) and Utility Advisor to the EPRI project.

The high profile of the project quickly brought interest from service providers and LeT is currently integrating the new emPower module as part of the OMS installation at a leading utility. Iain Ritchie, Senior VP and Head of North American Operations for LeT explains, "Its very rare a company in our business has such ideal system parameters going into product development and to be endorsed by such a distinguished group of industry leaders is outstanding. These advances in technology will give our users a definite advantage in restoration forecasting and incident recovery well into the future."

Imagine a disaster, natural or otherwise, has decimated hundreds of square miles of service territory leaving thousands of people without energy and "in the dark". The affected utility has to act fast and with the utmost efficiency to inform customers and restore power as quickly as possible but the very magnitude of the destruction has taxed the utility's physical resources beyond its limits.

The emPower Solution

The software is a real-time, stand-alone, web-based program built around advanced programmed intelligence and robust algorithms that can be easily and cleanly interfaced as an overlay with a user's embedded OMS. The added functionality not only eliminates the high costs of replacing client server and mainframe applications installations but also extends the economic life of any existing in-house OMS. In the case where two or more utilities with disparate software packages are united through merger the new module can act as an integrator to keep all systems productive.

Disaster and emergency recovery is rapidly becoming as crucial to the industry as the most important function of any real-time operations management system and preparedness is key. This is where the use of the emPower advanced programmed intelligence comes into play by analyzing the costs and benefits of a variety of "what if" scenarios to most effectively acquire and deploy resources to address the operational objectives. This powerful tool also stores all activity for replay so utilities can re-visit the "scene" which allows storm personnel the ability to learn and practice under the many scenarios and conditions and dramatically minimize the potential for costly mistakes that could arise from "on the job" training during actual incidents. It also means post storm analyses can be carried out with the utmost attention to detail. The emPower procedures build confidence among control room operators and field service crews which can aid significantly in split-second decision-making.

From the get-go, the need for information about the extent of damage and what's being done about it will be simultaneously coming in from every direction and from different sources. Total restoration planning comprises the ability to provide groups of customers with the most accurate range of times they are planned to be restored and is often based on priority with the most urgent being attended to first. This could range from security and public safety to critical care such as hospitals, crucial public utilities to extended care facilities to the largest single group per specific repair and so on until the last customer is re-energized. Following basic management and business rules with the help of emPower will make an enormous difference to mutual aid management where help from neighboring utilities and contractors is identified. By referencing the external resource coordinator within emPower, the utility can start immediately releasing accurate data to the outside and begin making informed decisions about external help requirements based on cost and desired restoration times.

Within hours, the entire complexion and personality of the event can change as dozens of field crews, repair vehicles, outside contractors, equipment suppliers along with police/medical/emergency assistance, and on-site support services start arriving at the location. emPower provides extensive procedural and logistical support needed to successfully integrate the foreign crews and equipment including lodgings, meals and transport. As resources are put in place the system automatically assigns tasks and schedules them in accordance with defined restoration goals and priorities. Incoming field crews can log directly into the system with their mobile data devices through the Web browser and be brought immediately up to speed with real-time status reports and identification of duties including on-board equipment needs, special skills requirements, and job locations and priorities. Through the unique features of the software the move forward is significantly smoothed out so the utility's Storm Manager can go about the business of better caring for customers.

No matter the size of a restoration, communications management is a highly important but labor-intensive and exacting task for an operator. In response, emPower tracks all activities and generates proper reports for internal and external agencies including, amongst others, utility management, police, emergency medical, media, customers, stakeholders, and government departments.

In the event security becomes an issue during an outage, utilities now have real-time assistance. Emergency Operations Centers (EOC) can be established to connect with local emergency services, law enforcement, and other key municipal, provincial, state, and/or federal agencies that can log directly into the EOC Liaison area and access updated requests made by the utility. This includes auto-scheduling to assist the relative agencies in deployment of their own specific resources. Reciprocally, it allows the EOC to notify the utility of security and public safety concerns such as roadblocks, collapsed buildings, toxic buildups, fire and flood potential etc., all of which can be plotted to map displays for a "bird's eye view" of the service territory. As sectors become secured, the information is relayed to the EOC so operators can track progress right on their computer screens. With regards the many coinciding events taking place during an outage, operatives can record and replay any activity to help in decision-making anywhere within the affected zones.

As an adjunct, emPower earmarks and manages all logistics amongst the huge volumes of data being generated daily during a restoration project and its operations log facility tracks and records all major communications between the EOC and the utility for future reference. To assist utility personnel in carrying out important security-related, but infrequently practiced, Emergency Operating Procedures, a checklist of activities is provided to ensure the utility's emergency response plan is followed by all personnel. This is instrumental in reducing the possibility for errors due to poor or misunderstood communication or oversight. The utility is also provided with a complete log of the key activities and decisions that were made throughout the restoration process.

Cornew continues, "I have been very impressed with how quickly the LeT people learned the complexities of utility operations during storm events and provided innovative approaches to meeting the needs of utilities."

Restoration following major outages will continue to place enormous demands on utility operations. emPower manages new components of the restoration process and utilizes the internet so effectively users from upper management to the repair truck, from virtually any location, can truly maximize time and efforts to get the lights back on. Being informed and better prepared for the worst provides the foundation for more competent, effective and quicker restoration efforts in the future. ■

About the Author

"Prepared by Terry Wildman with Iain Ritchie, Senior VP and Head of North American Operations for LeT Systems. Mr Ritchie has a M.A. in Psychology and M.S. in Information Technology from Glasgow University where he is also completing his Ph.D. in Artificial Intelligence.

UTILITY SAFETY CONFERENCE & EXPO

2003

April 23 & 24, 2003, Henry B. Gonzalez Convention Center
San Antonio, Texas

Welcome to UTILITY SAFETY Conference & Expo 2003!

This year's event promises to keep alive the traditions established by past USC&E's. Once again we're offering an educational experience that is utility safety specific and the chance for you to get a close-up look at the latest in safety products from exhibiting companies.

We want you to get the most out of your time with us, so enjoy the seminars and be sure to visit the exhibit hall and see what's new. We know you'll find the solutions for all your safety concerns.

Seminars

The tradition of excellent educational seminars now includes a total of 30 breakout sessions and two keynote addresses. New this year is the "proceedings notebook" will be on Compact Disc. The same complete set of seminar information and handouts, just a different, easier-to-carry medium. Don't worry though, note taking pages can be found within your showguide.

Keynotes

Rudy Ruettiger, the former Notre Dame football player whose hard work and never quit attitude inspired the hit movie "Rudy," is the luncheon keynote speaker. Being one of the most popular motivational speakers in the United States, Ruettiger will be teaching attendees team-building techniques and inspiring them to never give up the fight for safety.

Carl Potter of Carl Potter and Associates will give the closing keynote entitled, "So Many Ideas, So Little Time." At the presentation Potter will overview the information presented at breakouts and keynotes. Through a facilitated process, everyone will join in to share their "Ah-Ha" experiences. If you attend this high-energy session, you will be happy to hear the boss ask, "What'd you learn?"

Questions & Comments

We are always interested in hearing your ideas, questions and comments. If there is a particular safety subject you'd like to see covered in one of our seminars, or if you have a suggestion for improving the conference & expo, we want to know about it. You can either stop one of the UTILITY SAFETY staff here at the show or send an e-mail to dkula@pracom.com

SCHEDULE AT A GLANCE

Tuesday, April 22
8:00 to 10:00 a.m.

Aerial
Minimum Approach Distance
TBA

Underground
Confined Spaces
Dave Mooney, Pelsue

Management
Safety on my Mind
Carl Potter, Potter & Associates, Inc.

Blood Borne Pathogens
Debra Beavens
Charlotte-Mecklenburg Utilities

Work Site
Power Line Hazard Awareness for the Non Lineman
Gary Coleman
Construction Safety Council

10:15 a.m. to 12:15 p.m.

Aerial
Ladder Safety
Pat Conroy, King & Neel, Inc.

Underground
Damage Prevention
Corey Potter, Subsite Electronics

Tuesday, April 22
10:15 a.m. to 12:15 p.m.
Continued

Management
Workers, Compensation
TBA

Communicating to Non-English Speaking Workers
Chris Krueger, Zerah Services, Inc.

Work Site
Utility Roadway Work Zone Safety
Scott Wolf, Incom, Inc.

12:30 p.m.

Keynote Address
Rudy Ruettiger

2:30 to 4:30 p.m.

Aerial
Ladder Safety
Patrick J. Conroy, King & Neel

Underground
Shoring and Shielding
Jon Preston, Speed Shore, Inc.

Work Site
Protectice Clothing
Celanese

Management
Contractor Safety Equals Good Business

Tuesday, April 22

Management
Continued
Bob Krzywicki & Jim Williams
Dupont Safety Resources

Stress, The Hidden Enemy of S, H & E
The Topf Organization

Wednesday, April 23
8:00 to 10:00 a.m.

Aerial
Aerial Device Safety
Joe Cisneros
Commercial Body Corp.

Underground
Confined Space Gases
Bill Ramsey
Phoenix Safety Consultants

Management
Safety Program Synopsis
Floyd Schulte & Michael Lewis
American Electric Power

Work Site
Power Line Hazard Awareness for the Non-Lineman
Gary Coleman
Construction Safety Council

Utility Roadway Work Zone Safety
Scott Wolf, Incom, Inc.

2:30 to 4:30 p.m.

Aerial
Fall Protection
Felipe Devora
Fretz Construction

Wednesday, April 23
2:30 to 4:30 p.m.
Continued

Underground
Damage Prevention
Corey Potter
Subsite Electronics

Management
Musculoskeletal in Juries Prevention
Kirk Perruccio, Pro-Activity

Stress The Hidden Enemy of S, H & E
The Topf Organization

Work Site
Enclosed Space Entry and Rescue
Mark Dombrowski &
Kevin Peltier, National Grid

Thursday, April 24
8:00 to 10:00 a.m.

Aerial
Fall Protection
Felipe Devora, Fretz Construction

Underground
Shoring and Shielding, TBA

Work Site
AEDs, TBA

Management
Asbestos Management for Utilities, Andy Oberta,
The Environmental Consultancy

1:30 p.m.

Closing keynote,
So Many Ideas and So Little Time
Corey Potter, Subsite Electronics

Exhibitors

Company	Booth
Altec Direct	324
Altec Industries	326
American Safety Utility Corp	212
Bashlin Industries Inc.	200
Board of Certified Safety Professionals	204
Buckingham Manufacturing Co.	505
Bulwark Protective Apparel	508
Burlington Safety Labs., Inc.	418
BW Technologies	221
Carhartt Inc.	209
Celanese AMI, PBI	408
Comasec Safety, Inc.	312- 314
Dicke Safety Products	330
DuPont Protective Apparel	319
Electromark Company	406
Elk River Inc.	412-414
Estex Manufacturing Co., Inc.	424
HD Electric Company	513
J. J. Keller & Associates, Inc.	417
Jordan David Safety	413
Magid Glove and Safety Mfg. Co.	207
MDI Traffic Control Products	307
Nova Scotia Textiles Limited	213
Pelsue Company	301
Performance Textiles	500
Potter & Associates International	308
Reliable High Performance Products	320
Sagatex North America Inc.	306
Salisbury	407-409
Sievert Industries	313
Silver Needle	201
Southern Mills, Inc.	512
Timber Wolf, LLC	325
Tingley Rubber Corporation	309
Topps Safety Apparel Inc.	520
TUF-TUG Products	208
Unitec Distribution Systems	507
Utility Risk Management Ltd.	420
WearGuard	502
Weather Guard Division/ Knaack Mfg. Co.	419-421
Westex Inc.	506
Workrite Uniform Co.	321
WSI Industrial Safety	220

Floor Plan

Utility Safety Expo 2003
April 23 & 24, 2003
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Circle **120** on Reader Service Card

Circle **121** on Reader Service Card

Circle **122** on Reader Service Card

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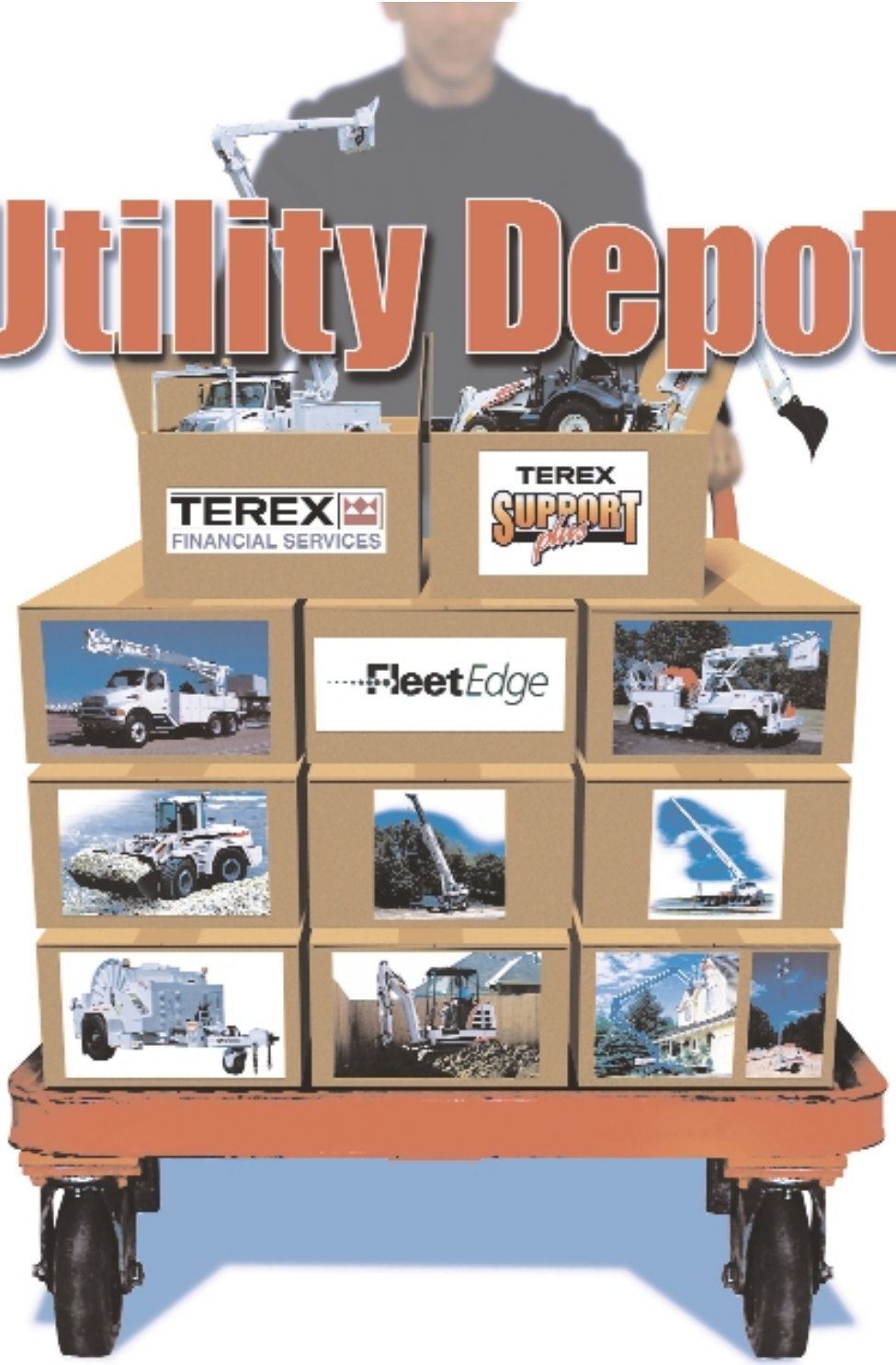
PRODUCT SHOWCASE

ADVERTISERS INDEX

RSC #	Company	Web Site	Page
127	**Aerotec, LLC**	www.aerotecusa.com	25
128	**American Pipe & Plastics, Inc.**	www.ampipe.com	46
129	**Arch Wood Protection, Inc.**	www.wolmanizedwood.com	21
130	**Association of Equipment Manufacturers**	www.icuee.com	52-53
131	**Autodesk, Inc.**	www.autodesk.com/gis	30-31
132	**Beckwith Electric Company**	www.beckwithelectric.com	4
133	**Bombardier Inc. /Utility Vehicles**	www.bombardier.com	6
134	**Brooks Street Advertising**	www.acza.com	57
135	**Canada Mayer**	www.canadamayer.com	43
136	**Canadian Electricity Ass.**	www.canelect.ca	55
137	**CIS Conference, Inc.**	www.cisconference.com	51
138	**Cybertech**	www.allenergyjobs.com	61
139	**Datel Inc.**	www.datel.com	14
140	**Datria Systems Inc.**	www.datria.com	48
141	**Drive Products**	www.driveproducts.com	42
142	**DTE Energy Technologies**	www.dtetech.com	66
143	**E.J. Brooks Company**	www.ejbrooks.com	5
144	**Edison Electric Institute Annual Convention/Expo**	www.eei.org/2003	63
145	**ESEA**	www.esea.com	38-39
146	**Flir Systems Ltd.**	www.flir.com	45
147	**Global Esmo 2003**	www.esmoconference.com	65
148	**Hastings Fiberglass Products Inc.**	www.hfgp.com	17-19
150	**Helinas**	www.canadianhelicopters.com	58
151	**Infonetrix**	www.InfoNetrix.com	60
152	**Iniven**	www.iniven.com	67
153	**Kema Inc.**	www.kemaconsultng.com	40-41
154	**Kinectrics**	www.kinetrics.com	75
155	**Logica**	www.logicacmg.com/us	32-33
156	**Maclean Power Systems**	www.macleanpower.com	23
157	**Manitoba HVDC Research Centre Inc.**	www.pscad.com	56
158	**Merichem Company**	www.merichem.com	74
159	**Metering Americas 2003**	www.metering.com/events	49
160	**Nasco Industries Inc.**	www.nascoinc.com	76
161	**NDB Technologies Inc.**	www.ndb.qc.ca	64
162	**Nehrwess**	www.nehrwess.com	67
163	**NxtPhase Corporation**	www.nxtphase.com	44
164	**Nynas Canada Inc.**	www.nynas.com	15
165	**Oberon Company**	www.oberoncompany.com	26
166	**Olameter, Inc.**	www.olameter.com	Cover #4
167	**Omnistar Inc.**	www.omnistar.com	34-35
168	**Optimum Energy Products**	www.optimumenergy.com	3
169	**Pauwels Canada Inc.**	www.pauwels.com	16
170	**PBP Preissinger GmbH**	www.pbp-preissinger.de	46
171	**Philips Medical Systems**	www.medical.philips.com/cms	7
172	**Piedmont Bushings & Insulators, LLC**	www.piedmontdielectrics.com	54
173	**Positron Industries**	www.positronpower.com	13
174	**Rugged Com Inc.**	www.ruggedcom.com	1
183	**SBB International**	www.sbbintl.com	47
175	**SchlumbergerSema Energy & Utilities**	www.slb.com/utilities/	11
176	**Stratos VSAT, Inc.**	www.stratosglobal.com	9
177	**Terex Utilities**	www.terexutilities.com	Cover #3
178	**TransiNor AS**	www.transinor.no	69
179	**Trimble**	www.trimble.com	36-37
180	**W.I.R.E. Services /Manitoba Hydro**	www.wireservices.ca	20
181	**Weidmann-Acti Inc.**	www.weidmann-acti.com	62
182	**Westex Inc.**	www.westexinc.com	Cover #2

Utility Depot:



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