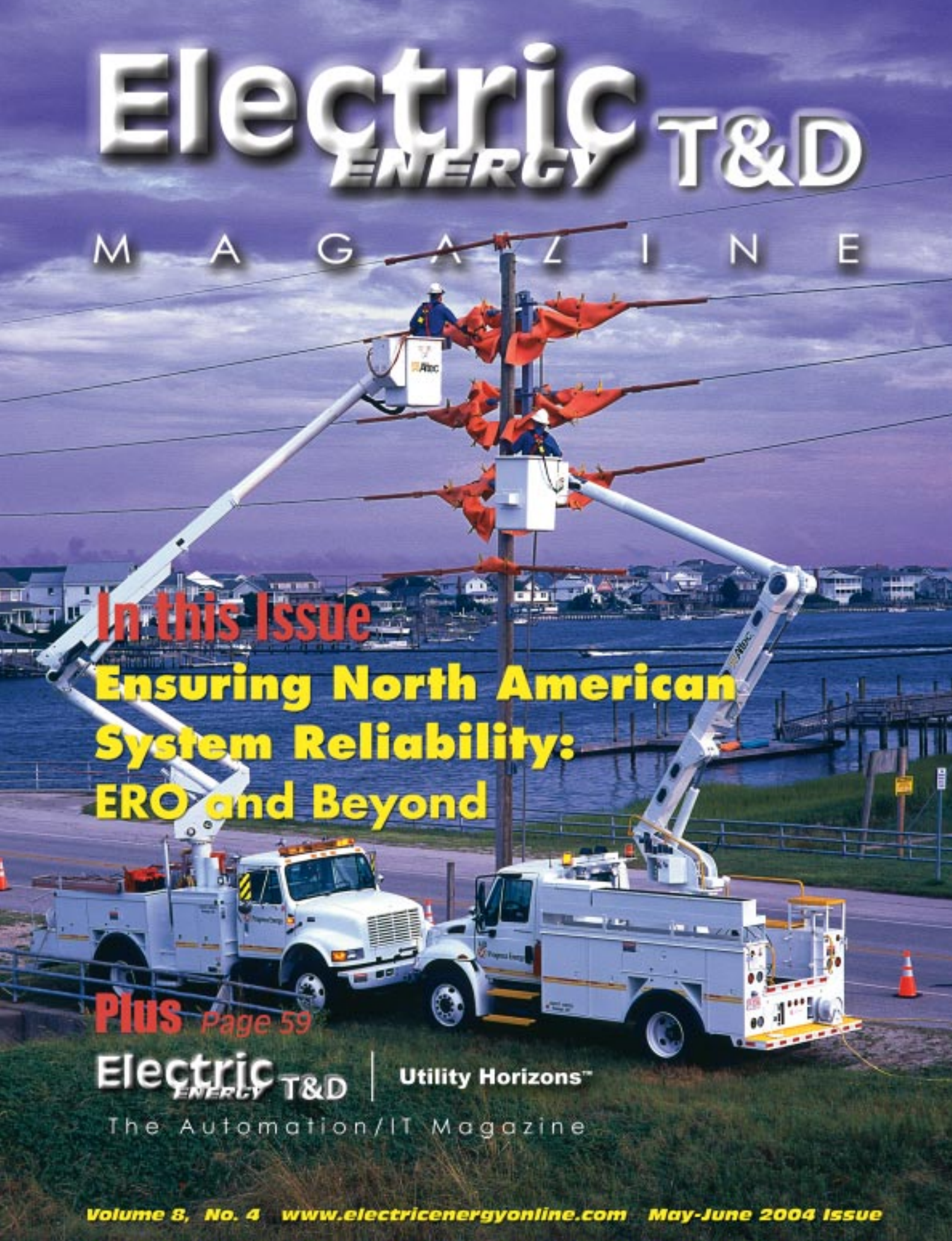
Electric ENERGY T&D MAGAZINE



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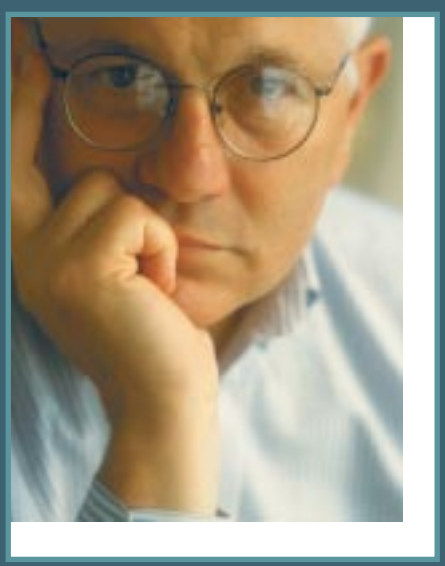

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Ensuring North American System Reliability: ERO and Beyond

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

The final report of the Canada-U.S. Power System Outage Task Force was recently released, and while the report has not shed additional light on the cause of the historic outage, described in detail in the interim report released last fall, it highlighted the importance of the interconnected bulk power system in North America, and the need to strengthen it.

The August 14, 2003 blackout in Ontario and much of the U.S. Midwest and Northeast heightened awareness of the electricity system, as 50 million people simultaneously experienced first hand how vital electricity is in our day-to-day lives. The blackout added a sense of urgency to the discussion already underway on the need for measures to ensure reliability in the electricity industry – one of which is mandatory reliability standards. In the U.S., action on such standards may be taken as soon as this summer. In Canada, enforcement frameworks are well-developed and continue to evolve throughout the country.

The irony of the 2003 blackout is that it took this extraordinary incident to make us realize just how reliable the system actually is. The interconnected network that exists across Canada and the U.S. is so reliable that:

- An event of this scale rarely occurs, despite remarkable economic and population growth, and relatively little grid expansion.
- In less than 12 hours, over 2/3 of power generation was restored to service and within 48 hours, virtually all of those who lost power were once again connected.
- The many equipment outages that occur in cities and regions across North America each year – due to weather, scheduled maintenance, or for safety reasons – are rarely even noticed by customers, as other points on the integrated system supply power to meet customers' needs.

Some suggested that the scope of the blackout could have been significantly lessened if the Canadian and American grids were not so highly integrated. Such comments fail to recognize the fact that the North American grid allows interconnected systems to absorb perturbations which occur routinely, such as the loss of a transmission line or generator, with no impact to customers.

The benefits of integration go beyond greater stability by absorbing loss. Cross-border electricity trade provides the opportunity to optimize the use of generating resources to the benefit of U.S. and Canadian market participants. For example, when linked across borders, the diversity of our systems, our climates, and our demand profiles allow for efficient power flows north or south at various times depending on market circumstances.

The resulting regional market efficiency gain reduces the need for generating facilities and results in lower generation costs to consumers. Moreover, electricity companies can derive environmental benefits through such efficiencies, for instance, coordinating on exchanges between "must-run" fossil-fuel fired gene-ration facilities and hydroelectric facilities. This involves a generator selling off-peak power to a hydro generator, allowing the latter to "bank" energy (in the form of stored water) in its reservoirs. During periods of high demand, the hydro generator releases enough water to meet its own needs and to assist in meeting the peak demand of its partner in this diversity exchange, thereby avoiding both emissions and higher costs from fossil peaking units. Such opportunities exist to a greater or lesser extent in each of the regional markets across the continent.

Efficiencies in regional systems management can also be achieved through participation in or coordination with regional transmission organizations (RTOs). In many cases, RTOs present an opportunity for the effective utilization of existing transmission infrastructure. In fact, some Canadian utilities are actively exploring participation in bi-national RTOs as an approach for optimizing the management of their respective transmission systems.

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Moreover, the integration of the U.S./Canadian electricity markets allows for the coordination of approaches to more effectively achieve reductions in the environmental impact of electricity facilities. No one technology is universally applicable across a national marketplace; resource availability, geography, and a host of other factors help determine the generation mix. The objectives of reliable, affordable, environmentally preferable power require that all technologies be available. In fact, increased integration enables the larger, combined U.S. and Canadian regional electricity markets to take full advantage of various emerging technologies, like wind power, whose intermittent nature requires backup capacity, to meet our future energy needs on a larger scale

International Solutions

By its very nature, the bulk power system is an international concern, and any effort to address its continued efficient and reliable operation requires the full engagement of and cooperation between the U.S. and Canada. CEA recently put forward a series of recommendations aimed at strengthening the integrated North American Bulk Electricity System. We identified seven measures for all stakeholders in the market to consider:

- Support an open debate on all of the supply options available to meet the growing demand for electricity.
- Encourage bi-national cooperation on the construction of new transmission capacity to ensure a reliable continental electricity system.
- Explore opportunities for bi-national cooperation for both investment in advanced transmission technologies and transmission R&D.
- Promote new generation technology and demand-side measures to relieve existing transmission constraints and reduce the need for new transmission facilities.
- Coordinate measures to promote critical infrastructure protection.
- Harmonize U.S. and Canadian efforts to streamline or clarify regulation of electricity markets.
- Endorse a self-governing international organization for developing and enforcing mandatory reliability standards for the evolving electricity industry.

These measures reach beyond mandatory reliability standards because addressing reliability means doing more than establishing mandatory standards – it requires a thorough effort in respect to all aspects of electricity supply in North America. There is a need for stakeholders in government and industry in Canada and the U.S. to come together to pursue these measures in a manner that is of benefit to all of us.

The Case for an ERO

The seventh and final measure identified above is the creation of an "Electricity Reliability Organization" (ERO) to establish North American reliability standards. The Joint Canada/U.S. Task Force Report pointed to the failure of some parties to follow NERC's voluntary reliability standards. Clearly, the present system of voluntary reliability standards must change, particularly as electricity markets continue to evolve. However, because the transmission grid is international in scope, the focus must be on solutions that are international as well.

The ERO model ensures a balance of interests that protects the organization from being unduly subject to any one stakeholder or government, while respecting the sovereign right of regulators in each country to assure the interests of their citizens are provided for through oversight and remand functions. And because only the ERO, as opposed to individual regulatory or legislative bodies, can develop reliability standards, the reliability system can be run effectively on an international basis.

Until such time as legislation passes in the U.S. Congress, the Federal Energy Regulatory Commission may consider other options to address reliability. In either case, the underlying reality remains the same: the reliability of the bulk-power system is by its very nature an international concern, and cannot therefore be properly addressed without full engagement of and cooperation with Canada. Anything less could impede future cross-border trade and, more significantly, undermine the very reliability we all seek to see guaranteed. We are currently developing specific suggestions for the operation of an ERO to ensure that it is truly international in nature. The exact nature of enforcement will vary from province to province.

The industry is committed to ensuring customers continue to receive affordable, environmentally sound, reliable power to meet their needs day in and day out. Identified in the Outage Report, effective enforcement of reliability standards is increasingly seen as a necessary prerequisite for that commitment to be fulfilled, and authorities across Canada have been acting on them for some time. As we move towards an international mandate-based regime, Canadian entities are well-prepared to participate in a manner that will ensure the continued provision of reliable electricity supply across the continent. ■

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Thermal anomalies are revealed by IR images (left to right) of a disconnect, a failed lightning arrestor, and a damaged transformer (center photo: R. Strmiska, Sumter Electric Cooperative)

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CCA Poles at T&D World Expo

Despite changes in the preservation of lumber for common residential applications, CCA remains a top preservative for utility poles. Nevertheless, some people still have questions and misperceptions about CCA-treated poles. At the T&D World Expo, CCA manufacturer Arch Wood Protection will discuss the latest in wood preservation issues. This includes the continuing uses for CCA, the role of copper-based preservatives in utility structures, and consumer

perceptions. Personnel in the booth will also be available to talk about the various options in climbing enhancements, e.g., treatment with ET® oil emulsion, wax, and polymer systems. They will have copies of the human health risk assessment, conducted by Gradient Corporation, that have been useful in reassuring concerned utility workers and electricity consumers of the lack of adverse health effects from CCA poles.

Arch Wood Protection manufactures preservatives that its licensed producers inject into poles and other wood products. ●

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Visit booth #1214 at T&D World Expo or go to www.wolmanizedwood.com/utilitypoles.shtml.

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Proactive weather planning allows utilities to adequately staff and position repair crews and supplies in advance of severe weather such as lightning, ice storms, thunderstorms, tornadoes, heavy rain and hurricanes.

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Why utilities are using these products:

* Alert Manager - notifies utility managers of significant weather changes. Notifications can range from visual or audible alerts, to automatically generated emails or pages.
* Lightning Manager - Utilities monitor lightning in real-time. This alerting tool allows a utility to set up notification and warning areas around their assets.
* Consultative Services - Utilities can speak with experienced meteorologists. Meteorologists are available 24X7 for discussion on past, current, and future weather forecasts.

Rich Wilson is the director of energy services at Meteorlogix, the world's largest commercial weather services provider. Based in Minneapolis, the company provides weather solutions to help customers oversee weather-related business risks, maximize personal safety and minimize financial loss. Meteorlogix serves leading electrical utilities including: Tampa Electric, Excel Energy, Wisconsin

Electric and NSTAR. Meteorlogix serves more than 20,000 customers with a focus on public safety, broadcast media, transportation, energy and aviation industries. ●

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Additional information about Meteorlogix can be found on the Web at www.meteorlogix.com.

Getac's new W130 notebook computer gets rough, rugged Military certifications for all weather/terrain environments

~ The W130 meets both the hardcore specs of the military AND expectations of retail users ~

Lake Forest, CA – Getac Inc., a leading pioneer in the rugged mobile computing industry, today announced that their newest ruggedized portable notebook, the MobileForce W130 racked up yet another US Department of Defense (DoD) certification by meeting the MIL-STD-461E standard, as required by the DoD for operating in environments with high electromagnetic emissions found in many defense operating scenarios. Using Intel's Centrino™ Mobile Technology and weighing in at only 5.9 lbs., the new W130 withstands three-foot drops/shocks and is a balance between the ruggedized needs of all terrain travel but with all the functionality of leading edge commercially available laptops. Value priced below comparable brands with fewer features, the W130 is the ideal

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Whether indoors or outdoors, the 12.1" XGA LCD screen provides superior readability with crisp, clear pictures even in direct sunlight because of a new A/R reflective coating technology that reduces reflectivity to 0.5% and a high-brightness, touch-screen panel. The BGA high performance video subsystem supports up to 64 MB of video memory options. Available options for supporting night activity and mobile installations include backlight keyboard and vehicle docking station.

Dirt and dust-proof, waterproof and drop proof from waist high, the durable, rugged construction of the W130 meets MIL-STD-810F and 461E, IP-51 and IEC extreme standards with its lightweight, shock resistant, ultra-durable magnesium alloy case fully sealed for water resistance. The notebook features shock-mounting for major components and the keyboard, display panel, touchpad and connectors are protected against impact, vibration, moisture and dust/dirt. ●

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Rugged Notebooks, a provider of combat-ready computers to the U.S. Military, announces the availability of a new notebook designed for the professional who works in a variety of environments. The Rough Rider Junior is perfect for the office, the truck, or the job-site.

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The recent report by Electricity Conservation and Supply Task Force and Independent Electricity Market Operator (IMO) forecast regarding acute power supply shortage in Ontario are wake up calls to take some immediate actions. It is the time to adopt strong strategies like Demand Side Management (DSM) to reduce this huge widening gap between its supply and demand at the earliest when sufficient supply options are not there.

Supply Shortage Forecast in Ontario

The Significance of Demand-Side Management (DSM)-its Tools and Techniques

By: *Satish Saini*

Since its deregulation in May, 2002, the available generation in Ontario has not been adequate as compared to its demand. Ontario has been depending on costly electricity imports from its neighbors almost every month. These supply shortages and costly imports have lead to high electricity prices in the Ontario. Moreover, no new generation is coming up in Ontario as expected. While its present generation plants are aging and coal plants are being closed by the year 2007 due to environmental reasons, our supply side options are going to be exhausted and we are left with no other options than to opt for strong DSM measures to manage our demand to the maximum possible extent. Otherwise we are going to face severe reliability problems in the near future leading to huge economic losses.

While going for any technology, program or adopting any tool, there are always some driving forces or factors which should be present to opt for that. Following are the major driving factors which push for adopting DSM as a tool for a stable and efficient electricity market in Ontario:

- Supply shortage
- Costly imports
- High prices
- Deregulated market
- Environmental concerns

Supply shortages lead to brownouts and blackouts creating reliability problems. This also leads to import costly electricity from outside. Both of these factors further contribute to high market prices creating an unstable and volatile market and putting uneconomical options for consumers. A deregulated market is the major platform to promote new programs like DSM because of the nature of this market structure-demanding a strong balance between supply and demand on real time basis. DSM through its tools like Demand/Load Response Programs and Time-of-Use rates has the capacity to create this balance more efficiently and timely rather than supply side management. In addition, the environmental concerns like reducing greenhouse gas emissions, saving natural resources and protecting environment is a big concern these days and most of our electricity generation plants are the major sources for environmental pollution.

All these driving factors are present in Ontario making it a strong case for adopting DSM. In the following sections we will examine the magnitude and significance of each of these factors.

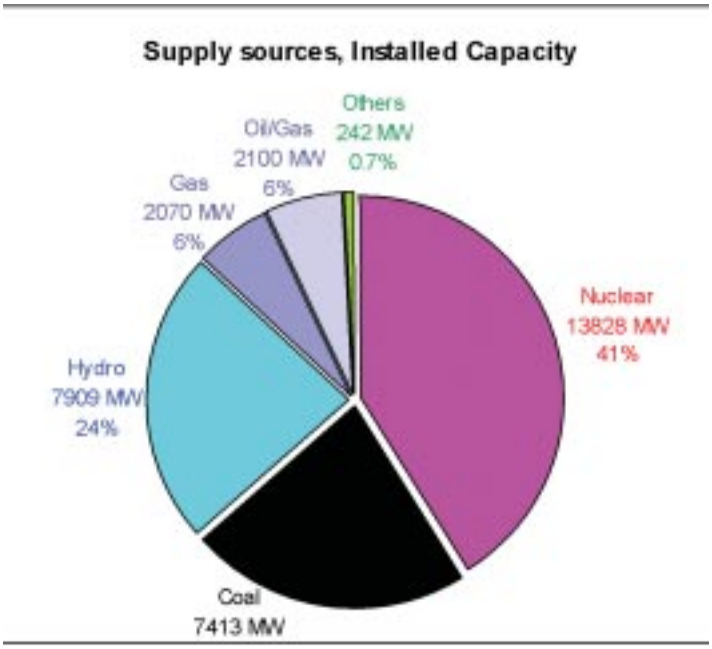
Demand and Supply Position in Ontario:

Since its deregulation on May 1, 2002, Ontario's generation resources availability has been below the expected levels especially when it experienced high demands. A number of times Independent Market Operator (IMO) controlling the Ontario Electricity Grid, was forced to issue power alerts due to insufficient reserve margins and had to make emergency purchases of energy at high prices.

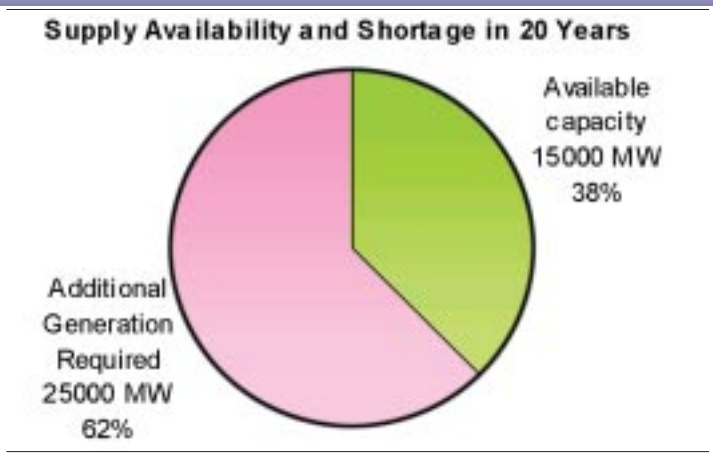
The chart below shows that a summer peak of 25,414 MW in the month of August, 2002 and a new winter peak of 24158 MW was faced in January, 2003, breaking the previous record set nine years ago.

Against this demand, though Ontario has sufficient installed generation capacity, but all the generation is not available at all times. Other than the short time planned and forced outages, a major portion of around 5000 MW of its nuclear capacity has been laid-off since 1997-98 for refurbishing. Out of that, only 2000 MW has been on-line by February, 2004. Still 3000 MW nuclear capacity is off-line with no definite time to restart.

As per IMO data for the month of May, 2003, the following is the generation/supply from various sources:



Out of this capacity, Ontario government has proposed to close its 7400 MW coal fired plants by the year 2007 due to environmental reasons. In the next 20 years almost all of its nuclear plants and some of the other sources are going to complete their active operational life and will need either refurbishing or replacement. In addition to this, the demand in Ontario is increasing at the rate of average 1.7% per year which comes out to be another 8500 MW required in the next 20 years. So even if we add the proposed nuclear plants already planned for refurbishing along with a few other sources, even then there will be a huge gap between available and required supply and 25000 MW of new generation will be required as follows:



This huge gap can not be filled overnight. It will take years of planning, funding, commissioning and all that.

Electricity Imports in Ontario:

Ontario had to depend upon costly imports from its neighbors almost for all the months to meet its need. The cause of these heavy imports and supply shortage is stated to be the forced shut down of some generating plants and the delays in returning other generating stations to service as planned that had been taken out of service for routine maintenance.

As the following chart shows, these maximum imports varied between 910 MW in May, 2002 to 4273 MW in September, 2002. The average of these maximum imports since deregulation till December 2003 is around 2800 MW, which is 11% of its maximum demand. Except the first two months, the maximum import during every month has been above 10% of the monthly maximum demand.

Electricity Prices in Ontario

In Ontario's electricity market the prices are set by the Independent Electricity Market Operator (IMO) through its real-time auction process for the supply of electricity.

The IMO sets the wholesale electricity prices by collecting offers from suppliers and bids from purchasers to determine on-the-spot market price for electricity. It uses these offers and bids to match electricity supply with demand, and establishes the Hourly Ontario Energy Price called HOEP. So energy prices change from time to time/hour to hour depending upon the system demand and available supply.

After deregulating the market, this price went high. Though this was due to initial unstable market, but due to public outcry, the Ontario government freezed the retail price to be paid by residential, commercial and other low volume designated consumers at 4.3 cents per Kwh in December, 2002.

Having a look at the following chart, we see that maximum HOEP since May 2002 has been as high as $1.02 per Kwh, i.e. 24 times higher than the fixed price of $ 0.04 per Kwh in September, 2002.

Even if we leave aside this maximum HOEP during the month which has been very volatile, and take the monthly weighted average of hourly market price, we find from the following chart that for most of the months the monthly weighted average price has been more than this fixed price.

After analyzing the maximum HOEP and Monthly Weighted Average Price of each month as compared to the fixed price, we see from the following chart that it was on an average 345 hours/times during a month (i.e. on an average 11 hours/times during a day) that the HOEP has been higher than the fixed price

What makes the prices volatile in a deregulated market:

It is the electricity technology and the economics of the electricity industry which contribute to the volatility of price in a deregulated market. Technically, electricity produced cannot be stored in economic ways, and its economics says that supply and demand must be kept in instantaneous balance to avoid high rising prices. So we should have a sufficient supply to meet with the rising demand or reduce demand as per the available supply on real time basis at every hour. So both these factors of supply shortage and rising demand create price volatility.

Environmental Concerns:

Canada's commitment towards Kyoto protocol is another major factor to manage and control our demands and put less burden on our generating plants and new generation to fulfill our commitment towards environmental protection.

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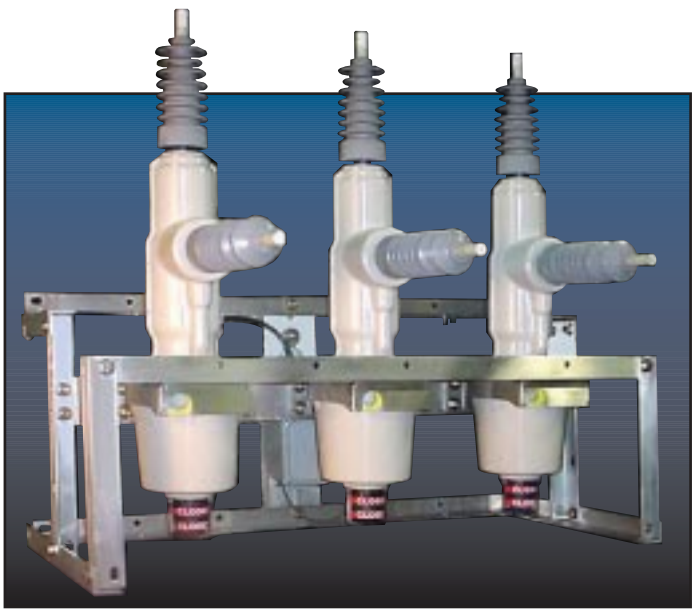

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  - 1Ø trip, 3Ø lockout
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Significance of DSM in Ontario

As discussed above, that all the driving factors are present in Ontario with a huge magnitude and a deregulated market is there, providing a strong platform to implement these technologies. The excessive and costly monthly imports by Ontario, high rising prices and future generation shortages compel us to think whether to rely solely on our neighbors for help or to take serious initiatives for the solutions.

The provincial policies by this time are not attracting any good investments in new power generation plants and our old plants already aging, so we stand on the verge of facing severe power crises in the future. And by this time we are familiar with the huge economic losses faced due to blackouts.

Moreover, seeing the electricity price almost always above the fixed set price and growing burden on the tax payers in the shape debt due to subsidies by freezing price, Ontario needs strong DSM strategies.

Potential of DSM in Ontario

As we have seen above that the hourly import levels in Ontario since its deregulation has been on an average 11% of its maximum demand or around 2800 MW. So with a monthly maximum demand of around 25000 MW and more of its nuclear generation is already on-line by February, 2004, it is not an impossible task for Ontario to be self-reliant in power by using additional DSM techniques. So with a target of managing 5% of the maximum demand initially i.e. around 1250 MW and then 10% i.e. 2500 MW in the coming years through DSM will strongly enable Ontario to make a balance between its supply and demand, promote self-sufficiency and thus lead to stable electricity prices and a stable market.

Even in one of the statement by a representative of IMO, it was mentioned that Ontario has been able to reduce demand by as much as 4,500 megawatts at times. This reduction was an important contributor to avoid the need for rotational power outages in Ontario after blackout. However we have not adopted any strong DSM programs and policies by this time.

This proves the potential of DSM in Ontario and what we need is a dedicated and sincere approach by various segments of the Power Sector in the province.

How to control Price Volatility and Supply Shortages

Today's electricity market has the two main components as "Technical"- related to supply reliability and "Economical"- related to affordable and stable electricity prices for consumers.

Both of these can be controlled either by Supply-Side Management by having sufficient supply availability to meet with rising demand or by Demand-Side Management (DSM) by curtailing electricity demand during times of supply shortages.

For short term measures the supply-side management is not effective as it takes long time for units to start up (if these are available) and meet the rising demand immediately, rather it is demand side management which can be implemented immediately and in more economic ways to keep the balance.

Moreover it is mentioned that- "Electricity saved is worth more than the electricity generated". One unit saved at consumer end is worth 1.10 units saved at the generator end, taking into account the long transmission and distribution line losses and all that.

Benefits of DSM:

The various benefits of DSM to consumers, enterprises, utilities, and society can be as:

- Reduction in customer energy bills.
- Reduction in the need for new power plant, transmission, and distribution network
- Reduced grid congestion
- Increased efficiency, being at the consumer end due to the reason that less power has to travel through long transmission and distribution lines reducing line losses
- Stimulating economic development.
- Creating long-term jobs due to new innovations and technologies
- Increasing the competitiveness of local enterprises.
- Reduction in air pollution.
- Saving our natural resources
- Reduced dependency on foreign energy sources.
- Reduction in peak power prices for electricity leading to stable energy market

We can achieve this by using various Techniques, Tools and Strategies for DSM as follows:

DSM Techniques

The most common DSM techniques can be classified as below:

- Energy Conservation and Efficiency Programs- to save energy
- Demand/Load Response Programs- To shift and reschedule energy consumption process

Energy Conservation and Efficiency programs

Energy conservation and efficiency measures are the best alternative energy sources.

There are various opportunities and techniques available for reducing energy consumption. A lot is needed to change some of our electricity usage patterns which has a potential to reduce the overall supply consumption. Other than conservation, there are a number of energy efficient equipments almost for all the categories of consumers such as efficient lighting, variable speed drives, solar hot water systems etc. which can reduce demand, help in lowering high peak prices and also reduce greenhouse gas emissions due to less stress on generating plants. In addition, we have now many renewable and alternate supply sources available in many sizes to meet our needs and help reducing burden on the traditional system along with increasing reliability.

Load Response Programs (LRP)

Load Response Programs are an effective part of Demand Side Management.

These are the actions undertaken in response to electricity supply position and wholesale market price of electricity. Or in other sense these refer to switching off or reschedule of non-essential and non-critical loads by the end users in response to the request of IMO, suppliers or the utilities. This can lead to save the system network from exceeding its peak rating.

There are a large variety of energy consuming equipments and applications that can be switched on or off at a particular time to reduce electricity demand from the network.

Tools for DSM

Every technology needs some tools to be used to achieve the desired results. Following are the main tools to be used for achieving DSM results:

Dynamic/Real Time Pricing

The present deregulated market is based on real time system of supply and demand. Prices change time to time and hour to hour depending upon these two factors. By exposing customers to Real Time/Dynamic i.e. time-varying prices, they can have a better view of the prevailing market and the information and incentive to reduce their demand at peak times and to shift their usage from high priced periods to low-priced periods.

Time-of-Use Rates

This is the tool or rate structure by which customers are offered different rates for electricity usage at different times of the day. Offering them lower rates for consumption at off-peak time can make them aware and motivate to use some of the power at those low-priced times for some equipments which have the flexibility of operation at different times.

Automated/Smart Metering

Implementing Dynamic/ Real Time Pricing or Time-of-use rate structure and billing accordingly is not a complex program now. Automatic/Smart Metering successfully used by various utilities provides the best effective solution to this problem. This Automatic Meter Reading (AMR) system has various other benefits which are customer oriented as well as utility oriented.

Web-based/ Communication System

This is a tool used along with the above to convey the customer about the prevailing demand, supply and prices on real time basis and the related incentives and options, which are used by the customer to manage the demand. In addition, there are other methods like E-mail, Cell Phone, Pagers and Fax etc. which can be used as a communication tool to convey the required information and data to initiate appropriate action.

Market Drivers based Programs:

Depending upon the supply and market position, there are two broad categories based on the market drivers:

Reliability-based programs:

These programs operate in response to the system contingencies. That is why these can also be called as "contingency" programs. These are used whenever there is an emergency of power supply in case of acute shortage due to less generation or more demand or due to some other system constraints. These programs are also called Emergency Demand Response Program (EDRP).

Market/Price based programs:

These programs are based on market price signals of electricity. This category includes programs that use time-of-use (TOU) rates/Real Time Prices, Interruptible Rates and Two-part Tariff. These rates are intended to reduce consumer bills through the application of time-differentiated rates. The consumer participants of these programs that curtail their loads at critical times of very high prices can also be paid some extra financial incentive to help maintain system reliability.

These programs can include **Day Ahead Demand Response Program**, where the end users respond to price signals and reduce loads when the price exceeds their set Base Price on day to day or day-ahead time basis as per demand, supply and price forecasts.

Types of Load Control:

The two main methods can be used to control the load at consumer premises depending upon the size of load and the infrastructure as:

Direct Load Control - Where load at the consumer's facility is controlled directly by IMO/Utility operator in consultation with them after careful planning and installing required infrastructure. This is particularly suitable for large supply consumers.

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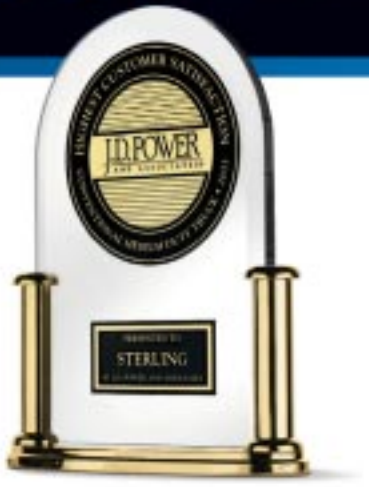

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Load Control by Consumer - Where only an information is sent to the consumer about the prevailing supply, demand and prices and quantity of load to be controlled and he has to take the action within the stipulated time

Participants of DSM/Load Response Programs

For implementing these programs, we need a strong government support through its various agencies. Ontario Energy Board (OEB), being a regulatory agency in the energy market, can play a leading role in promoting these programs.

Other than the Ministry of Energy and OEB, following are the key potential participants for these programs who can promote, implement and monitor these programs:

- **Independent Electricity Market Operator (IMO) -** controlling the electricity grid and large supply consumers
- **Utilities/Suppliers -** supplying electricity to consumers for medium and small supply
- **Consumers -** being the end user of electricity

Each of these units has its own significant role to play. But the optimum results can be obtained by coordination of all of them. Government agencies can make various policies and regulations, provide incentives, subsidies and technical support for these programs and Utilities/suppliers can implement these programs more effectively through different cost-effective and customized options in coordination with the end-users i.e. the consumers.

Factors effecting Load Response Programs:

However implementing these technologies and techniques is not always so cheap. Though there are many opportunities where we can apply them without any additional cost or investment. But to apply them at large scale for the whole market there are various factors to be considered as:

- Cost to the customer to shed and reschedule the load
- Time it takes to activate the load response
- The variation in wholesale price
- Losses to occur otherwise in case of reliability problems due to acute shortage
- Any losses in production by implementing these programs

DSM Program Approaches:

Various approaches can be adopted to achieve benefits of Demand Side Management as:

- General information programs for customers about energy efficiency options.
- Information programs about specific DSM techniques appropriate for industry
- Financing programs to assist customers to pay for DSM measures
- Turnkey programs that provide complete services to design, finance, and install a package of efficiency measures at the consumer end.
- Alternative rate programs by the utilities like time-of-use rates and interruptible rates to shift loads to off-peak periods.
- Schemes and incentives to invest in energy conservation and efficiency programs
- Incentives for new innovations and technologies for Load Response/Load Management Programs.

DSM Programs Strategies

The following strategy may be adopted to design and implement DSM program:

- Identify the sectors and end-users as the potential targets
- Visualize the needs of the targeted sectors
- Develop the customized program
- Conduct analysis for cost-effectiveness
- Prepare marketing strategies for the program
- Develop a Project Execution Plan for its implementation
- Implement program
- Monitor program for its deliverables and for further modifications

Successful DSM Studies

We have many successful examples and models studies showing substantial benefits by adopting Demand Side Management tools and techniques.

It has been studied in U.S. that with universal application, peak energy demand could be lowered by at least 30,000 MW nationally, equivalent to perhaps as many as 250 peaking plants that would not need to be built. Society could avoid the burning of 680 bcf of gas per year and 31,000 tons of NOx emissions.

A study in 2002 showed that New York's electricity market along with its grid operator and large electric utility companies has the potential to reduce demand for electricity by at least 1300 megawatts (MW) through Demand Side Management techniques, which is enough to supply power to 1.3 million homes.

Conclusion

DSM has the potential to provide significant economic, system reliability and environmental benefits.

From economic point of view, it can reduce dependency on expensive imports, reduce high energy prices and help in avoiding heavy investments in new generation transmission and distribution network to a good extent.

As per system reliability, it plays an important role in mitigating electrical system emergencies, avoiding blackouts, avoiding transmission grid congestion and so increasing system reliability.

DSM can help protect our environments by saving our natural resources, reducing burden on our present generation plants leading to less greenhouse gas emissions and reduces the requirement of new generation.

DSM techniques are the cheapest, fastest and cleanest way to solve our electricity problems. These can be implemented immediately and many times most of the results can be achieved at one-tenth the cost of building new power plants.

This is what needed at this moment in Ontario along with its long term strategies to add new generation through various supply mix options to fill the wide gap in supply and demand. It is more significant especially when it is passing through the phase of uncertainty, already partially backed out from its deregulation policies by placing price caps, its aging existing power plants and very less new generation coming up. The strong presence of all the market drivers of DSM along with its sufficient potential make a strong case for its implementation in Ontario. ■

About the Author

Satish Saini has Bachelor's Degree in Electrical Engineering with various professional development courses. He has extensive experience in managing Energy Programs, providing product and project support on Energy Efficiency and Management, Renewable Energy Sources, Power Distribution Automation, Demand Side Management and developing various engineering programs for professional development.

He has been an independent Unit Manager in a provincial Utility/Energy Supply Company with numerous accomplishments and achievements in various fields of planning, policy formation, business development, utility customer services, Power system commissioning, operation, maintenance and testing. He has managed more than 100 projects including prestigious National Level Pilot SCADA Projects in Distribution Automation and Energy Management.

He is an active member of various Professional Bodies like IEEE, Association of Energy Engineers USA, Institute of Power Engineers Canada, Ontario Society of Professional Engineers and many others. He is also associated with Canadian Standards Association in its three Technical Subcommittees on Energy Efficiency Projects. He is actively associating in Price Structure policies in a Deregulated electricity market, Demand Response Programs, development of Renewable energy sources in the current scenario and need of Power Distribution Automation in the utility industry.

He is a member of Council of Energy Advisors, USA and was awarded "Certificate of Recognition" by the Metropolitan Executive & Professional Registry for his professional achievements in 2003.

He can be contacted at: satishksaini@yahoo.com

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In cooperation with the National Safety Council, you can also accrue Certified Utility Safety Administrator (CUSA) contact hours for attending our safety sessions. You will not only receive excellent training, but you will also get credit for attending the sessions.

Be sure to ask for an early wake-up call on Wednesday morning so you can enjoy your morning coffee while listening to the opening keynote address by Carl Potter, Safety Professional and CEO of Potter & Associates.

Carl's unique presentation, "Who Is Responsible for Safety?" will get your attention because he knows of what he speaks! He has over 17 years of field experience and is an experienced supervisor and business manager. His presentation is credible to audiences at all levels. "Who Is Responsible for Safety?" is a must attend session for all members of your organization

I don't recommend sleeping in on Thursday, either. Our second day keynote address by Peter Furst, Technical Director of Contracting Services for Liberty Mutual's National Technical Center, is another must attend session. Peter will illustrate how to align safety performance with business strategies – why safety delivers value to your company.

Not only will you have the opportunity to learn from industry experts during the next few days, you will also have a chance to learn from your peers. We have designed the conference around your educational needs to include numerous opportunities to network with other safety professionals.

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Schedule of Events

Wednesday - May 12, 2004

7 am: Registration Opens

8:00 am - 9:00 am: Keynote Presentation:

"Who is Responsible for Safety?" Ballroom D
Carl Potter, sponsored
by Vivid Learning Systems, Inc.

About the presentation: *Executives? Supervisors? Safety department staff? Or you? Why is it important to know the answer to that question? After all, everybody, at every level, talks about working safely. In this 90 minute presentation the audience learns how to take personal responsibility and why it is important to them. Carl's unique presentation impacts audiences because he knows of what he speaks! He has over 17 years of field experience and is an experienced supervisor and business manager. His presentation is credible to audiences at all levels. Who Is Responsible for Safety? is an effective presentation for all members of the organization. Your organization needs this message!*

About the speaker: *Carl Potter works with organizations that want safety first in the minds of their employees, so everyone can go home every day without injury. After 17 years with a large U.S. electric utility, he spends his time presenting and consulting to bring his frontline, hands-on experience of personal responsibility and safety to companies all over the country.*

9:15 am - 10:15 am
Seminar Session: Stress:
The Hidden Enemy Room 552 A
Michael Topf, the Topf Organization

About the seminar: *Over the years, the role of stress seems to have been downplayed in most behavioral approaches when addressing the causes of accidents, injuries, health issues, and environmental incidents. Now, however, its harmful effects are better understood. Come hear how stress affects workers and what can be done about it. This seminar will:*

- *Explore the role of Stress in causing accidents, injuries, health issues, and environmental incidents.*
- *To determine the primary sources of stress that affect us in and out of the workplace.*
- *Introduce effective strategies to counteract the negative effects of stress on S, H & E performance.*

9:15 am - 10:15 am
Seminar Session: "Fall Protection" Room 551 A
Jim Mooney - Bacou-Dalloz

About the seminar: *This seminar, which will address the latest fall protection regulations and give practical solutions to daily fall protection usage problems.*

9:15 am - 10:15 am
Seminar Session:
"Confined Spaces: Safety Procedures" Room 553 B
Bill Shirley, Technical Safety Services Group, LLC

About the seminar: *Learn about the proper techniques for both identification and elimination of confined space hazards. Also, learn about confined space rescue techniques.*

9:15 am - 10:15 am
Seminar Session:
"Utility Roadway Work Zone Safety" Room 550 B
Scott Wolfe, Incom part of Dicke Safety Products

About the seminar: *This session will discuss the following topics regarding safety of workers along the right of way and compliance related issues regarding changes to standards in the work zone. We will discuss the major changes to the Federal MUTCD and the Nov. 2003 Revision to that manual. We will discuss such topics as High-Visibility Safety Apparel, The Americans with Disabilities Act, OSHA, and other referenced standards within the New Fed. MUTCD. Attendees will get an idea of what changes to the Federal MUTCD will affect them in their work zones and how they will affect them.*

10:30 am - 11:30 am
Seminar Session:
"Improving Supervisor Effectiveness" Room 552 A
Carl Potter, sponsored
by Vivid Learning Systems, Inc.

About the seminar: *In this one-hour presentation, you will learn what it takes to maximize your effectiveness as a supervisor including the first place to look for an unsafe worker and how to quickly determine when a worker is unfit - and unsafe - for duty. You will learn what it takes to motivate different generations of workers and how to build safety teams from stormy beginnings. You will leave with at least twelve ideas that you can implement immediately to improve your effectiveness in leading workers in a hazardous environment.*

10:30 am - 11:30 am
Seminar Session:
"Aerial Devices Operational Safety" Room 550 B
James Christian, Time Manufacturing

About the seminar: *When it comes to understanding how to safely operate aerial devices, ignorance is most certainly not bliss — it is dangerous. Time Manufacturing's James Christian will provide useful information about operational safety of aerial equipment, including current and prospective regulations, new technology and more.*

10:30 am - 11:30 am
Seminar Session: "Contractor Safety – Challenge for Owner and Contractor" Room 551 A
Robert Krzywicki, DuPont Safety Resources

About the seminar: *The proliferation of contract workers across the electric utility industry begs two critical questions: How do utilities ensure that contract firms/workers perform safely while working on the utility's system? And how does working safely positively impact meeting business objectives for both the utility and contractor? A "must attend" for both utilities and contractors in today's competitive marketplace.*

10:30 am - 11:30 am Seminar Session :
"Lockout/Tagout" Room 553 B
Bob LoMastro, LoMastro & Associates, Inc.

About the seminar: *This seminar focuses on the importance of an effective lockout/tagout procedure and thoroughly defines the hazards that exist when that procedure is not followed. LoMastro defines the "Fatal Five" causes of lockout/tagout injuries and helps you develop a procedure that prevents injuries, including examining the lockout/tagout application, its removal, temporary equipment reactivation, and potential problematic circumstances.*

11:30 am – 5:30 pm Exhibit Hours
11:30 am - 1 pm Lunch in Exhibit Hall

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- Fabrics are inherently Flame Resistant, not FR Treated that could be laundered out.
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- Faceshields and windows are available with scratch-resistant coating for extended life.
- Oberon's Arc Flash Hoods, Clothing and Faceshields comply with NFPA 70E, ANSI Z87.1, ASTM F1506-02a. Oberon has led the industry in complying with ASTM F2178, developed by American Society for Testing and Materials (ASTM) in 2002. This standard is based upon a test method developed and used by Oberon for over a decade.

Oberon also offers a complete line of protection choices:

- **ArcPlus™ Electrical Arc Dailywear** for NFPA 70E Hazard Risk Category #1 & #2 electrical work. Designed for use by employees exposed to lower levels of arc flash thermal energies (below 8cal/cm²), ArcPlus Dailywear shirts, pants and coveralls fully comply with all aspects of NFPA 70E.
- Oberon's world-renowned line of **Flashguard ArcFlash Hoods & Clothing** is available in a series of levels to best suit the needs of your application. Oberon has the solution for your hazard level: from our ARC15 (15cal/cm² or HRC#2) to ARC25 (28cal/cm² or HRC #3) and ARC40 (43cal/cm² or HRC#4) and beyond to our ARC65 (68cal/cm²) and ARC100 (111 cal/cm²).

- Oberon's **ArcShield™** faceshield provides 12cal/cm² of thermal energy protection for use in tasks identified as HRC #1 or #2. Lightweight, superior visible light transmission, it is the industry standard for face protection.
- In 2003, Oberon released an industry first: Ballistic Arc Flash protection. Incorporating Ballistic Kevlar into the fabric configuration, the **ARC100 Ballistic** offers not only 112cal/cm² of protection against the thermal energy of an arc flash, it offers an additional level of tested ballistic protection not found anywhere else in the industry. It is designed for use where there is a concern for flying debris and shrapnel.
- Oberon offers a full line of **Rubber Insulating Gloves** and protectors to complement its line of Arc Flash protection… from Class 00 to Class 4.
- Oberon's **ArcFlash Gloves** are an additional product, ideally suited for those such as Thermographers who are working within the Hazard Approach Boundary but will not be working on an energized circuit.
- Oberon's **Arc Suppression Blankets** provide a passive barrier from peripheral arc blasts. Ideal for confined spaces such as underground vaults, the blankets deflect the thermal energy of an arc blast occurring beyond the primary work area. It is easy to install. Oberon's 15kA blanket is lightweight and non-combustible as well as inert to exposure to the sun's UV light. It is manufactured of a proprietary, patent pending material, Carateen™.
- Oberon's **FreshAir™ Hood Ventilation System** is an exclusive solution to those who find the use of a hood to be hot and stuffy. For many tasks, using a hood is required by the standards and work policies. However, for some people, tasks and environments, using a hood can be uncomfortable. The FreshAir system blows a steady stream of external/ambient air into the hood, down across the face. The result is safety and compliance.
- Additionally, Oberon offers the **Arc Flash Cooling Vest.** Actually arc tested, the Vest provides comfort to the user who may need to work live, wearing the ArcFlash clothing for extended periods of time.

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- ☑ **Superior Window** - Oberon's Arc Flash Hoods incorporate the new ARC-X™ Arc Flash protective windows. These revolutionary new Polycarbonate windows offer the same arc protection with significantly better visible light transmission (VLT) & strength than any arc flash window built before! The windows are coated on the outer surface to be scratch resistant for economy, with a permanent Antifog coating on the inner surface.
- ☑ **Comfort** - Oberon builds its products with comfort of the user in mind including Lighter Weight Fabrics, the FreshAir™ Hood Ventilation System and the Arc Flash Cooling Vest.
- ☑ **ArcPlus™ Electric Arc Dailywear** - Oberon is proud to announce the release of its new Arc Flash Dailywear products. Shirts, Pants & Coveralls designed & built to fully comply with NFPA 70E. Available for Hazard Risk Category #1 & #2.
- ☑ **Rubber Insulating Gloves** - Oberon now offers a full Arc Flash PPE kit which includes arc flash clothing, rubber insulating or Arc Flash gloves and carry bags in a full range of Arc Hazard Levels & Voltages!
- ☑ **Compliance** - All of Oberon's lines of ArcShields & Flashguard clothing comply with NFPA 70E, ASTM F1959, ASTM F1506 & ASTM F2178.

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Schedule of Events continued

1:00 p.m. – 2:00 p.m.
Seminar Session: "National OSHA Update"
Room 550 B
Felipe G. Devora, OSHA

About the Seminar: *Make sure you're up to speed on OSHA regulations with this National OSHA Update presentation from the Directorate of Construction. This seminar will focus on the following subjects:*

- Review of 2003 fatalities in construction
- Most frequently citied hazards 2003
- OSHA initiatives Trenching, Hispanic workforce
- A status of proposed standards. Confined Space, Crane and Derricks, Silica, Occupational noise

1:00 p.m. – 2:00 p.m.
Seminar Session: "National Grid's Non-Entry Presentation" Room 553 B
Mark Dombrowski & Kevin Peltier,
National Grid

About the Seminar: *Learn about how the management and union at National Grid USA worked together to develop a "Non Entry" rescue procedure utilizing body harnesses and lifelines for underground manhole rescue. This system will be reviewed in an effort to provide others a way to perform "Non Entry" rescue in the event a manhole becomes a confined space, as defined by OSHA.*

3:30 pm – 5:30 pm
Attendee Reception in Exhibit Hall

Thursday May 13, 2004

7 am
Registration Opens

8:00 am - 9:00 am Keynote Presentation:
"Value Driven Safety Management"
Ballroom D
Peter Furst, Liberty Mutual Group

About the Presentation: *Peter Furst will discuss ways you can take an innovative approach to safety management, including:*

- Typical Safety performance measures
- The urgent need for change
- Innovative business performance and management tools and techniques
- Aligning safety performance with business strategies
- Utilizing the balanced Scorecard technique in safety

About the speaker: *Peter G. Furst, MBA, RA, CSP, ARM, REA Technical Director of Contracting, Liberty Mutual Group, Pleasanton, CA. Since 1995, Mr. Furst has been the Technical Director of Contracting Services for Liberty Mutual's National Technical Center in Pleasanton, California. He is responsible for the Pacific, the West and Northwestern Regions (13 states); as well as the Pacific Rim Countries served by Liberty Mutual Group's International Division.*

9 am – 12:30 pm Exhibit Hours
11 am – 12:30 pm Lunch in Exhibit hall
12:30 pm Passport Vacation Drawing
1:00 pm - 2:00 pm Seminar Session:
"Incident Prevention" Room 552 A
Bob LoMastro, LoMastro & Associates, Inc.

About the seminar: *Often times, incidents are looked at as events that damage property or injure workers. Bob LoMastro will discuss how companies must look at all unplanned events that interrupt a job or task as an incident--even if there is no physical or property damage resulting--in order to effectively prevent danger in the workplace. Topics addressed will be how to motivate staff to report all incidents, how to establish an effective safety committee and how to examine and define job hazards and proactively prevent them through a consistent and well-lead safety program.*

1:00 pm - 2:00 pm
Seminar Session: "Ladder Safety" Room 551 A
Ken Zack, Louisville Ladder Group, LLC

About the seminar: *This seminar will help attendees avoid ladder incidents by teaching them how to choose the proper ladder for the job, how to inspect, maintain, discard or repair the ladder, how to set up the ladder and how to safely climb one.*

1:00 pm - 2:00 pm
Seminar Session:
"Fit for Duty" Room 553 B
Nancy Hitchins, Tampa Electric Company

About the seminar: *As a corporation, we are committed to providing a safe work environment, protecting the health of the employees and providing reasonable accommodations in accordance with the Americans with Disabilities Act. The purpose of a comprehensive fitness for duty program is to protect the physical health and well-being of all employees, and to provide guidelines that will assist in the determination of an employee's ability to safely perform the essential functions of the assigned job. Critical to the program are medical evaluations as well as current job descriptions, inclusive of essential physical functions. Many of the tasks performed in the Utility Industry are physically challenging. An open discussion of specific challenges within the industry will be encouraged during this presentation.*

1:00 pm - 2:00 pm
Seminar Session: "Protective Clothing"
Room 550 B
Maryann Medeiros – OSHA

About the seminar: *The protective clothing standards have seen several updates recently. Get up to date on the changes to the standards and learn about the latest protective clothing products created in response to these changes.*

2:15 pm - 3:15 pm
Seminar Session: "Aerial Equipment Safety"
Room 552 A, Dr. Josh Chard, Altec Industries

About the seminar: *ANSI A92.2 2001 Vehicle-Mounted Elevating and Rotating Aerial Devices went into effect August 1, of 2002. It has formalized the training responsibilities of manufacturers, dealers, owners and users of covered equipment. General training, familiarization, and retraining are now specifically addressed. The presentation will discuss these new requirements, existing OSHA regulations, and offer solutions for the training aerial device and digger derrick operators. New developments in international standards will also be discussed. This presentation would also cover examples of aerial device and digger derrick accidents typical in the industry. It would then highlight trends and particular accidents types recently observed.*

2:15 pm - 3:15 pm Seminar Session:
"Safety Management Leadership" Room 551 A
Carl Potter,
sponsored by Vivid Learning Systems, Inc.

About the seminar: *In this one-hour presentation, your will learn what it takes to lead a successful safety program in an economy where budgets are tight, insurance premiums are high, and litigation is prevalent. You will learn about the role of management and how to balance the needs of employees with the needs of management. You will leave with at least eight practical ideas that can be implemented immediately to lead your organization to a culture of safety.*

2:15 pm - 3:15 pm
Seminar Session: "The In's and Outs of Confined Spaces" Room 553 B
Dave Mooney, Pelsue Company

About the seminar: *As a proficient interpreter of the OSHA confined space entry regulations, Dave Mooney will break down how safety regulations apply to general industrial customers as well as specifically to telecommunications industry. Whether working in permit required spaces, or standard telecom vaults, Dave's program, "The Ins and Outs of Confined Space" will leave you with a better understanding of Confined Space safety.*

2:15 pm - 3:15 pm Seminar Session:
"Preventing MusculoSkeletal Disorders"
Room 550 B, Michael T. Eisenhart,
PT, Pro-Activity Injury Prevention Specialists

About the seminar: *MusculoSkeletal Disorders continue to plague the American Utility Workforce. This near epidemic, which includes a host of common disorders such as sprains and strains of the low back and extremities, costs billions of dollars, accounts for an immeasurable amount of lost productivity, and is associated with thousands of disability cases each year. Unfortunately this classification continues to place a largely unchecked burden on the industry and workers alike and is even mistakenly considered by some companies to be "the cost of doing business".*

Please Note: May 11 - 13, 2004
Show Office - Room 550 A
Speaker Ready Room - 553 A

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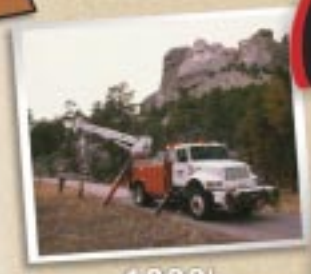

1980's

1985 – Developed the Commander 5000 Series

1986 – Developed the Commander 6000 Series

1988 – Introduced the Telecon II

1989 – Introduced the General
- Introduced Fiber Optic Controls

1960's

1960 – Many Innovative Developments
- PG Winch
- Continuous Rotation System
- Rite Way Auger Storage
- Fiberglass Pin on Extension

1962 – Introduced the Telecon (TELelect ECONomy), a force in its time.
- Introduced Dual Cylinders

1964 – Introduced the First of the Commander Units and Box Constructed Booms

1990's

1992 – Developed the "32" Series

1992 – Developed the Commander 7000 Series

1995 – Introduced the Commander 4000 Series

1997 – Introduced the latest Generation of Radio Controls

1998 – Develop the L4000 Series

1999 – Introduce the XL4000 Series

WHEN EXPERIENCE COUNTS

1970's

1972 – Started Radio Control Division

1976 – Developed the "C" Series Digger Derrick

2000-Present

2002 – Introduced the Captain 3039 Digger Derrick

2003 – Redesigned the Commander 5000 & Commander 6000 Series
- Introduced the New Generation of the the Telecon Digger Derrick

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EXHIBITORS

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COMPANY	BOOTH#
Altec Industries, Inc.	201
American Safety Utility Corp.	106
AVO Training Institute	301
Bacou-Dalloz	209
Carhartt, Inc.	101
Coastal Training Technologies	202
Comasec Safety, Inc.	115
Construction Safety Council	307
Dicke Safety Products	220
Draeger Safety, Inc.	300
Electromark Co.	210
General Machine Products	121
J. J. Keller & Associates, Inc.	310
Johnston Textiles Inc./ Protective Fabrics	221
Knaack Mfg.	114
Lightguard Systems, Inc.	216
Mabey Bridge & Shore, Inc.	100
MetaMedia Training Intl., Inc.	321
Nova Scotia Textiles, Limited	214
Pelican Products	317
Performance Textiles	110
Safety Flag Co.	208
Safety Source – Northeast	111
Scott Instruments	200
United States Dept. of Labor – OSHA	303
Utility Contractors Assoc. of RI	109
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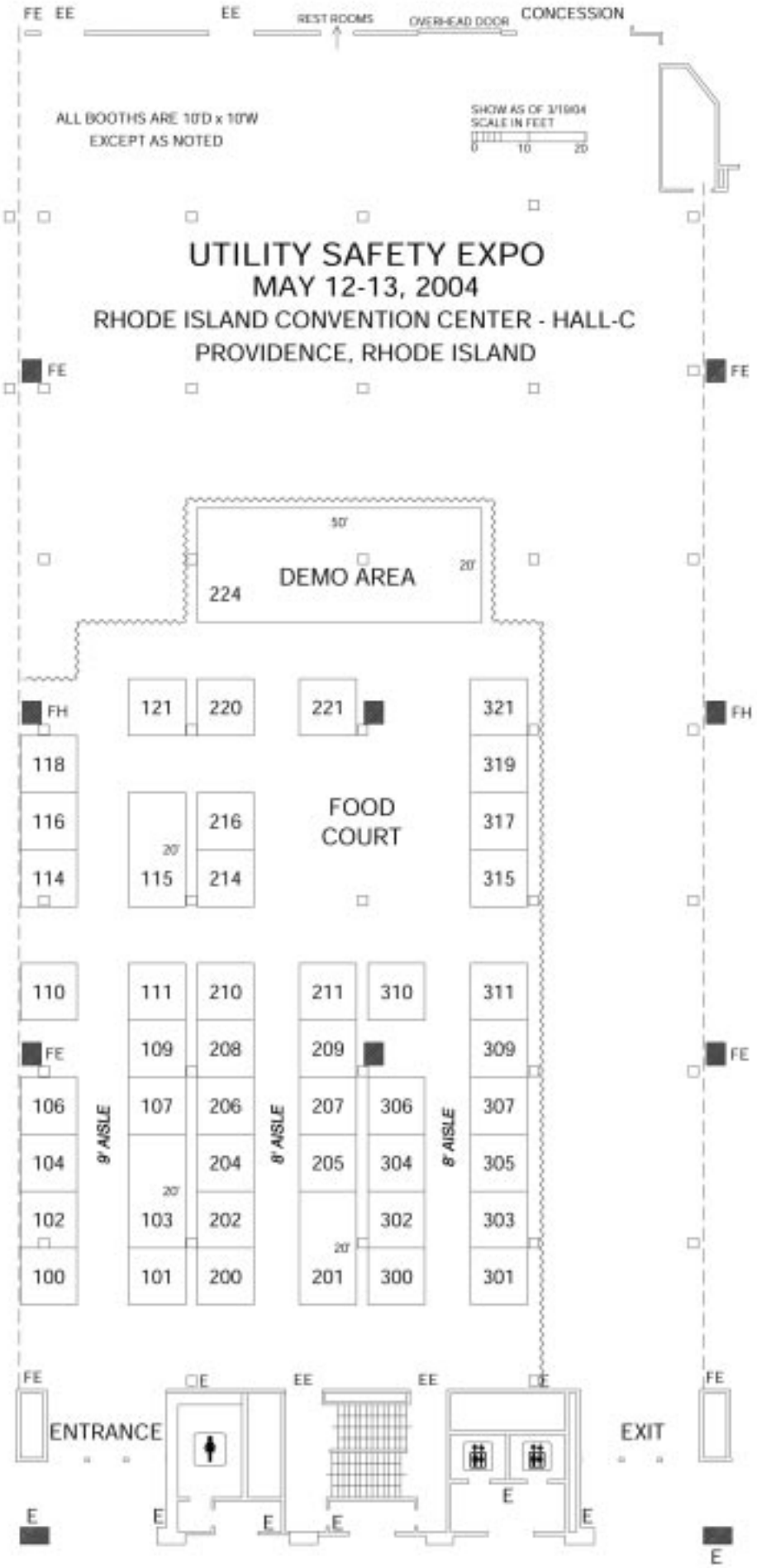
USC&E 2004

FLOOR PLAN



2004 IEEE PES Power Systems Conference & Exposition

October 10 - 13, 2004
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2004 IEEE PES Power Systems Conference & Exposition: This inaugural power systems event will provide an exceptional venue for discussing issues and developments in the multifaceted field of electrical power systems. It will bring together an international group of practicing power systems engineers, operators, planners, policy makers, economists, academics and others with interest in the profession. The meeting will begin with a timely and valuable plenary session entitled "Balancing the Needs of the Competitive Markets with Confidentiality and System Security," and will also address the lessons learned from the August 14, 2003 blackout in North America. The conference will comprise an outstanding combination of technical sessions, panel sessions and tutorials focusing on the following tracks:

- *Track 1: Planning and Operation*
- *Track 2: Markets, Policies, and Economics*
- *Track 3: Dynamic Performance of Power Systems*
- *Track 4: Real-Time Applications*
- *Educational Track: Understanding Power Systems*

The Exposition - A Highlight of the Event

The exposition will showcase state-of-the-art software and hardware systems as well as consulting services for those involved in the power systems area. There will be times devoted exclusively to the exhibits--with no parallel technical sessions scheduled--so attendees can focus on the displays and have a chance to speak directly with vendors on the latest technologies, systems, software, hardware, and services as well as give exhibitors the opportunity to interact with many potential customers.

For more information on your company's opportunities to exhibit at PSCE 2004, access the meeting website through the PES homepage at www.ieee.org/power

Hosted by: conEdison

Table 1 is a quick overview of how the market has evolved since 1994. Almost every garment category has seen major changes in the past ten years. I've also included some major equipment innovations designed to protect workers which have come as a direct result of the arc clothing market.

Table 1

1994	2004
Popular Rainwear	**Popular Rainwear**
FR Polyurethane on Nylon	NASCO ArcLite and others
Various Suppliers	PVC on Nomex Kevlar
Material melted and would continue to burn in arc conditions	Material self extinguishes in arc conditions and has high breakopen resistance and good protection value. Offered in several styles and manufacturers and weights.
	ASTM F1891 applies to rainwear.
Popular Shirting	**Popular Shirting**
8.5-10 oz cotton shirts	7 oz. Indura UltraSoft
	4.5 oz Nomex-Lenzing Blends
	5.5 oz Indura UltraSoft
	ASTM F1506 applies to clothing.
Popular Trouser	**Popular Trouser**
11-15 oz 100% cotton jean	11-15 oz 100% cotton jean
6 oz Nomex Pant	12-14 oz. 100% FR Cotton Jean
9 oz Indura Pant	6 oz Nomex Pant
	9 oz Indura Pant
	9 oz Indura UltraSoft Pant
	14-15 oz New Offerings Indura UltraSoft
	88/12 FR Cotton/Nylon Jeans
	ASTM F1506 applies to clothing.
Popular Winter wear	**Popular Winter wear**
100% cotton shell jackets with polyester batting and nylon liner	Nomex and UltraSoft Shell jackets with Modacrylic linings or Nomex batting linings.
	ASTM F1506 applies to Winter wear.
Popular Flash/Switching Suits	**Popular Flash/Switching Suits**
100% cotton jackets or the Steelgrip 16 oz Green Nomex "pickle suit" with hood and clear faceshield.	ASTM F1506 and ASTM F2178 are two standards which now apply to Flash Suits.
	Steelgrip, NSA, Salisbury, Oberon, Stanco, Chicago Protective, Spedmill, and others offer 10-30 oz/yd suits for 25-110 cal/cm^2 Arc Rating.

Protecting Workers, Saving Lives:

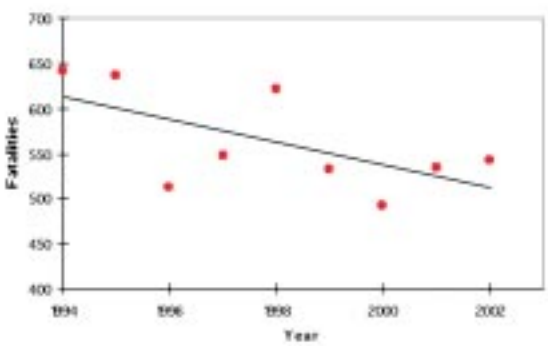
OSHA Apparel Standard 1994 to Today

By: Hugh Hoagland
Consultant, ArcWear.com

By: Victoria Reed
University of Southern Indiana and ArcStore.com

There is no such thing as perfect protection from flame and electric arc hazards but the advances in arc and flame resistant clothing have come a long way to reduce the severity of even the worst accidents and preventing many injuries. However, as a result of OSHA rule 1910.269 (1)(6)(iii), "The Apparel Standard", promulgated in 1994, many lives have been saved and horrendous burns avoided.

Prior to 1994, most utilities recognized the risk faced by workers wearing easily ignitable or melting fabrics when exposed to electric arc hazards. Many instituted a 100% natural fiber requirement for workers but enforcement was sporadic and workers didn't understand the melting and ignition risk associated with cotton blends and synthetics.



Statistics from BLS website, Belinda Cannon, USDOL/OSHA. Analysis by Hugh Hoagland ArcWear.com. To see calculations visit www.arcwear.com/stats.mht

In 1994, over 600 workers a year were dying from electrical accidents which often include an arc component. The trend since the implementation of the OSHA "Apparel Standard" 29 CFR 1910.269 (l)(6)(iii) and the resulting increase in electrical workers wearing flame resistant clothing has played a great part in reducing those fatalities. A more difficult issue to measure is that workers are also being less severely burned in electrical accidents as a result of the protection afforded by arc resistant clothing. An accident I investigated last year is an excellent example. The worker's shirt came in contact with a high voltage line and the electricity conducted through the sweat in his shirt. This worker received second and third degree burns under his arm. But, because the shirt was arc resistant, it did not continue to burn and the burn was limited to the area directly exposed to the arc. Had this worker been wearing a 100% non-FR cotton shirt he would have likely received 45% body burns from the ignited shirt. His burns were less than 10% of the body and he returned to work in less than 6 months.

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1994	2004
Fall Protection	**Fall Protection**
None had been tested by manufacturers. Duke Power and LG&E Energy had tested some by Bashlin and Buckingham.	NEW ASTM F887-2004 standard offers a 40 cal/cm^2 arc test built into your specification. Bashlin and Buckingham have harnesses which meet this standard. Miller, MSA, DBI-Sali, Klein Tools, French Creek are planning harnesses to meet this standard.
Popular Clothing Programs	**Popular Clothing Programs**
Most utilities had none. Some offered non-FR shirts and non-FR outerwear. Almost no utility had FR clothing on the average line worker.	Now most utilities have one. Most offer FR items and replace them as needed. Many offer allowance programs with a $500-1500 start up and $300-700 per year to maintain the clothing. Some offer uniform programs which include cleaning and repair
Hazard Assessment	**Hazard Assessment**
Few if any engineers understood Arc Flash Hazard Analysis	ArcPro (from Kinectrics) led the way in Arc Flash Hazard analysis and now IEEE Standard 1584 has codified and broadened calculations from the NFPA 70E Standard and seeks to standardize Arc Flash Hazard Analysis methods.
Switchgear	**Switchgear**
Switchgear was one of the commonly recognized hazards at this time	New Arc Flash Resistant Switchgear is making engineering out the hazard a potential reality in one of the most hazardous and common arc exposures. Square D www.squared.com S&C Electric www.sandc.com GS Online www.gs.on.ca
Network Hazards	**Network Hazards**
Network Hazards were the worst hazard with little hope of engineering out the hazard.	New work by ConEd on Arc Flash Blankets and a new ASTM taskforce on development of a standard for testing and development of the blankets is making great headway in developing ways to increase worker protection in the uninterruptible networks in most large cities. Thermequip, Salisbury, Oberon, BarrDay, Burlington Safety
PPE	**PPE**
Innovative PPE for Arc Flash was almost non-existent since there was little recognition of the hazard.	Innovative devices such as GaryGuard which is an arc resistant polycarbonate shield which attaches to a hotstick, can shunt up to 50% or more of the arc energy away from a worker in hotstick applications. www.garyguard.com
Gloves	**Gloves**
Gloves were just assumed to be needed though there had been ignitions. No studies had been done.	Today a full glove ignitability study has been conducted on Salisbury (www.whsalisbury.com) gloves and these results are available at www.arcwear.com/gloves.pdf Black gloves more than double the protection of any other color. New studies are in the works to make gloves even more arc resistant with composites.

The apparel standard launched the move toward flame resistant (FR) clothing among electric utilities in the US, and has had a much more profound impact than any of us anticipated at time. In 1995, I was working for Louisville Gas and Electric and spent a few hours a month on the apparel standard, which was initially focused on the ignitability of cotton and polyester/cotton shirts and trousers. As my study branched out to winter wear and rainwear, I began collaborating on inventions with manufacturers such as NASCO for the first PVC coated Nomex and Nomex-Kevlar blend to be used in FR rainwear, and I patented the first arc resistant face shield with Paulson Manufacturing.

This new market potential was and is tremendous. Now I, along with many other professionals, spend 100% of my time testing, consulting and training in the area of electrical arc hazard clothing protection. Some more recent innovations include better thermal insulation in arc resistant garments; lighter, tougher rainwear; a NEW dielectric AND arc resistant fall protection harnesses [Webb-Rite Safety 225-930-9045 and BioPlastics www.bioplastics.us]; and arc hood cooling, air circulating innovations [Steelgrip www.steelgripinc.com and NSA www.nsamfg.com].

In 1994 the availability of FR Clothing (FRC) was limited to two primary competitors with one primary choice each: Indura FR cotton from Westex and Nomex IIIA from DuPont. These materials are still popular due to their price per wearing, comfort and widespread availability. Today the leading shirt and pant materials in the electrical arc resistant clothing market are the FR cotton-high tenacity nylon blend fabrics such as Indura UltraSoft; and aramid fabrics which includes Nomex IIIA and Nomex-Lenzing Blends (such as Comfort Blend, Nomex AP and others); and Tufweld which is commonly used as a shell for flash suits. Other players such as FR cotton nylon blends like Banwear and Johnston Textiles, and spent carbon materials like Carbtex and CarbonX are finding niches in the FR clothing and flash suit market.

Arc resistant rainwear materials like PVC on Kevlar-Nomex, and PVC on Nomex are accepted standards in the industry with most electric utilities in one of these types of materials.

Arc Resistant raingear has come a long way with leaders like NASCO (www.nascoinc.com), Neese (www.neeseind.com), and a few others offering arc resistant rainwear materials to utilities. NASCO's popular ArcLite ProSeries is the first utility product to become a standard in non-melting arc resistant rainwear. PVC on Nomex-Kevlar is so effective in the arc that many utilities use it with an archood as their flash suit.

Arc resistant winter wear, which represents those critical outer and innermost layers of protection, is still coming along with more companies switching to the arc resistant winter wear offered by the big players like Workrite, Bulwark and Carhartt. The new UltraSoft Duck winter jackets and parkas are similar in design, comfort and warmth to their non-FR alternative but they are light-years ahead in their arc protective ability. Accidents involving ignition of winter wear and lining materials are forcing more companies to move to upgrade to arc resistant winter wear.

Companies offering arc resistant winter wear include Ago Industries, Midwest Garment Apparel and Securitex in Canada and Bulwark, Carhartt, NSA, Steelgrip and Workrite in the USA.

Concerning arc resistance and undergarments, the only advice you would receive in 1994 was to wear cotton. Now cotton, wool and silk are recommended and after several accidents including melting bras on female workers, ArcStore.com has developed the ArcBra, ArcPanty and ArcBrief which offer non-melting, FR and arc resistant garments complete with arc ratings in popular designs.

Another concern in arc resistant clothing has been the use of disposables in transformer oil clean-up and oily potential arc and gas environments. New arc resistant disposables are now available including Bulwark's Extend FR which is a lightweight FR Sontara and SoftGuard DTP for applications

which want more arc resistance. SoftGuard DTP has an arc rating of 14 cal/cm² for a 6 oz disposable product and is available from Lakeland (www.lakeland.com). For FR applications which need chemical resistance with arc and flame resistance there is CRFR also from Lakeland.

Fall Protection has been a stickler ever since the OSHA standard prohibited nylon and polyester from use in apparel on electric utility workers but now the NEW ASTM F887 Fall Protection Standard offers arc tested harnesses which have been tested to 40 cal/cm² without ignition and still able to perform the drop test. This standard can assure utilities that fall protection will still work after most arc flashes at dangerous heights or to retrieve workers in manholes.

The NEW NFPA 70E-2004 takes another step by taking arc resistant clothing from the utilities to all electricians with an easy to use table format for specific jobs outlining the proper PPE for workers. This standard has been a leader since the 2000 version, which introduced FR clothing to general industry and the job table for ease of compliance.

Before the OSHA Apparel Standard in 1994, some US and Canadian utilities had used FR clothing in specific applications but the apparel standard was the first legislation on the subject in the world and it fostered a growing market of better PPE options. Today interestingly enough, Peru is the only country which has adopted FR clothing for all line workers as a matter of law, but the OSHA standard has effectively moved more and more North American utilities toward mandating that arc and flame resistant apparel be worn by utility workers. This standard has been a great help in protecting workers and saving lives. ■

ABOUT THE AUTHORS

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Victoria Reed, University of Southern Indiana and ArcStore.com victoria@arcstore.com

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May 18-19, 2004

Exposition hours: Tuesday, May 18 and Wednesday, May 19 (8:30 a.m. to 4:30 p.m.)

International Centre, Mississauga, Ontario, Canada

To obtain more information:
Jacqui Elliott, Show Manager
Tel.: (416) 512-1215, ext. 226
Fax: (416) 512-1993
E-mail: jacqui@yorkcom.to
Web Site :www.cuee.ca.

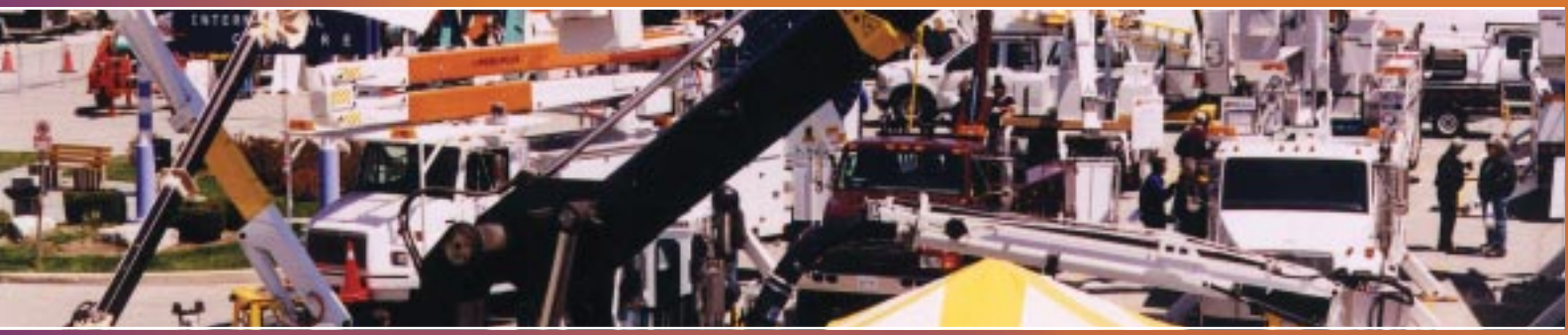
Canadian Utilities Equipment & Engineering Show (CUEE)
Exhibit: May 18-19, 2004
International Centre
Toronto, Ontario, Canada

CUEE

CANADIAN UTILITIES EQUIPMENT AND ENGINEERING SHOW

FREE SEMINARS

Seminar	Company	Speaker	Timeslot May 18th, 2004
Smog Ease: A Choice For the Environment	Mobile Power Solutions Inc	Pierre Latulippe & Peter Harris	9:30 AM
Transformer Oil Maintenance and sF6 Gas Reclamation	Enervac	Enervac	10:30 AM
The Benefits of Advanced Metering Technology	Olameter Inc.	Bruce Orloff	11:30 AM
Infrared Eye for the Substation Guy: Monitoring and Predicting Thermal Problems via Fixed or Handheld Technology	FLIR Systems	Greg Bork	1:30 PM
An Introduction to Optical Sensing Technology	NxtPhase Corporation	Bill Lackey	2:30 PM
Equipotential Grounding and Bonding	E&USA	E&USA	3:30 PM
Seminar	**Company**	**Speaker**	**Timeslot May 19th, 2004**
Salisbury Arc Flash Presentation	W.H. Salisbury & Co	Vladimir Ostrovsky and/or Mark Fallon	9:30 AM
Insulating Oil Testing: A Powerful Tool for Prioritizing Maintenance	TJ|H2b Analytical services	Sudhir Kumar	10:30 AM
Fault Location and Sectionalizing with TDR Assisted Thumpers on Primary Underground Cables	The Von Corporation	Jerry Landers	11:30 AM
Partial Discharge Testing: Online Insulation Test	Magna Electric Corporation	Gale Goodnough	12:30 PM
Monitoring, The First Step to Energy Conservation	Langford Associates	Eric Langford	1:30 PM
Preventative Maintenance of Power Transformers	ADWEL International Ltd.	Ian Lawrie	2:30 PM
Equipotential Grounding and Bonding	E&USA.	E&USA	3:30 PM



EXHIBITORS

As of April 30th, 2004

COMPANY	BOOTH #
3M Canada Company	100
ABB Inc.	644
Abloy Canada Inc.	916
Advanced Battery Systems Inc.	609
Advanced Control Systems	317
AGO Industries Inc.	142
Algal & Associates Ltd.	237
Allan Fyfe Equipment Ltd.	130, Outdoor E
Alliance Corporation	444
Allteck Inc.	139
Almetek Industries	119
Altec Industries Ltd.	Outdoor F
AMAC Equipment Limited	Outdoor C
American Electric Lighting	546
American Polywater Corporation	317
Arch Wood Protection Canada Corp.	111
Atlantic Braids Ltd.	234
Automated Solutions International Inc.	529
Badger Daylighting Inc.	124, Outdoor M
Bashlin Ind.	236
Bel Volt Sales Ltd.	746
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Bridges Electric Inc.	438
Bronto Skylift/Hycotec Inc.	Outdoor D
Brooklin Concrete Products Limited	Outdoor B
C.D. Nova-Tech Inc.	543
Cable Master Inc. and HDW Electronics, Inc.	500
CABLETEL / Power & Telephone Supply of Canada	600
Canada Power Products Corporation	207
Canadian Cable Injection Services Inc.	622
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Wessuc Inc.	646
Whelen Canada	114
White Radio	912
Wilcox Bodies Limited	Outdoor A
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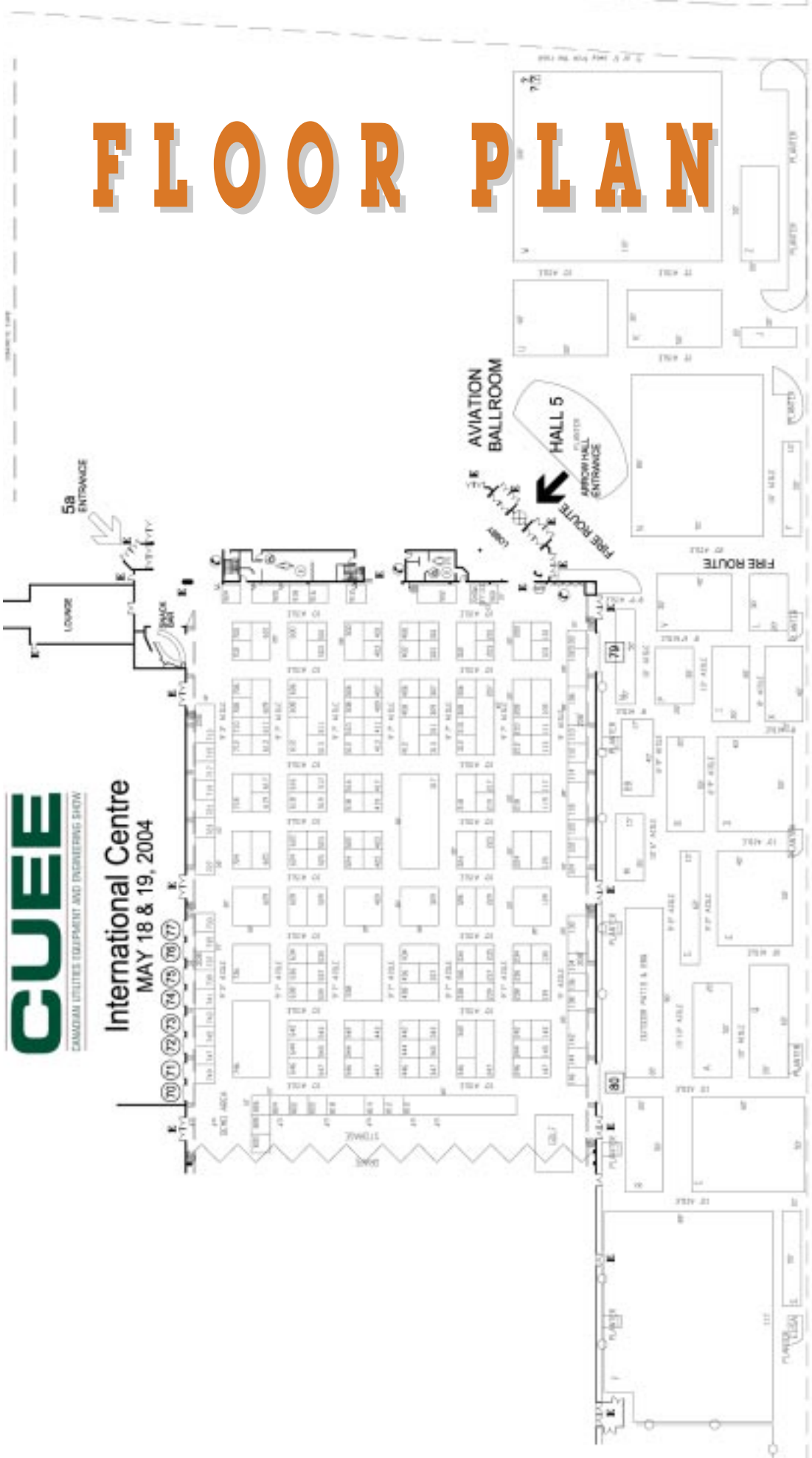
FLOOR PLAN



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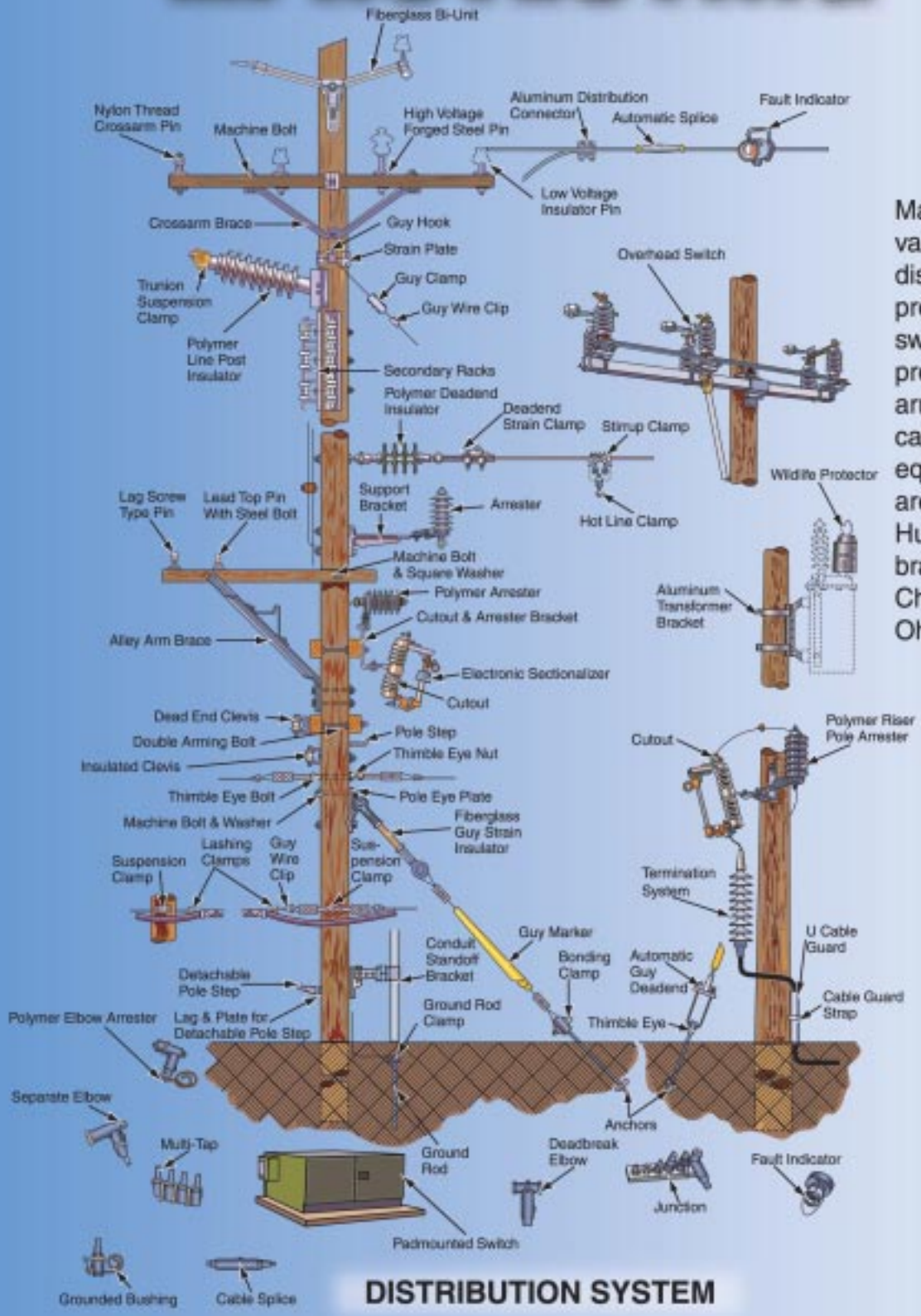

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April 2004

ABB Introduces Voltage Assessment Tool

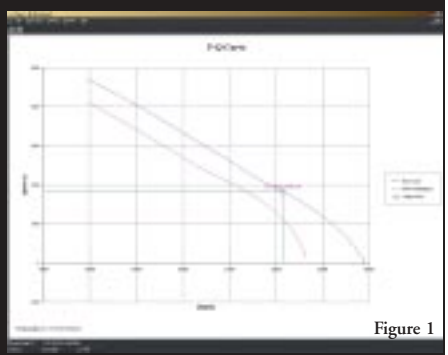

Figure 1

ABB's Voltage Security Assessment (VSA) application computes the voltage collapse curve for increasing loading condition both for the real time network condition as well as for worse contingencies. These P-V curves provide the critical operating MW limit for which the grid reliability is protected against the worst contingencies. Predicting this critical point is crucial to the grid operator because it provides the operating margin with which he is currently operating the system. By monitoring this margin, the operator can make decisions that will continue to maintain the grid reliability.

The voltage collapse curves and the critical point computed for a practical network model of 5000 load flow busses are shown in Figure 1. The critical point is the MW operating point on the base voltage curve at which voltage collapse occurs for a worst contingency minus the operator selected safe margin.

Utilities Must Leverage Existing Resources and Upgrade Technology to Avoid Future Blackouts

By: *Ralph Masiello, Senior Vice President, Energy Systems Consulting, KEMA Inc.*

The blackout of August 14, 2003 thrust the issue of transmission grid reliability into national prominence. Since then, the energy industry, congress and even the public have voiced concerns over the deficiencies that have been exposed in the technologies, standards and processes governing reliability management. This scrutiny is gradually changing the perception of what should be required of energy management systems and the people who use them.

Of the many lessons learned in the aftermath of the blackout, two emerge as particularly valuable. The first is that deregulation has changed energy transmission patterns, resulting in energy flowing through the network in ways the grid was not designed to handle. It is nearly impossible to simulate failures in the grid when the flow of energy cannot be predicted in advance. This dramatically increases the chances that when a failure occurs, control center personnel will have had little or no experience recognizing it and dealing with it properly.

The second big lesson is that the traditional "N-1" contingency analysis is not adequate. Traditionally, utilities operated their systems so as to be safe against the first (or in some cases the first and second) worst "credible" contingency – meaning the worst single outage event to a transmission line, generator, transformer, or substation busbar that was deemed "credible" or possible within some range of reasonability. When doing system planning, utilities aimed to meet standards for the "Loss of Load Probability" derived from statistics for generation outages – meaning that sufficient generation reserves should be available to meet statistically expected outages such as to keep the expected MW Hours of load lost in a year under the LOLP standard. Transmission was planned so as to not cause an outage within the "N-1" criteria. Standards for operating the systems were similarly established.

What the blackout showed is that the first transmission outage can in fact make the second and subsequent outages more likely to happen, and that in the real world multiple outages are in fact "credible" – often with linked root causes of human error in maintenance and operations.

Energy management system (EMS) technology and the standards and procedures related to it are the focal point for the changes that must be made. For most utilities, the solution can be carried out in two phases. In the near term, transmission companies must leverage the key resources they already have – control center systems and personnel – by training their staffs to use existing EMS capabilities to prepare for failures and handle them effectively.

In the long term, utilities must work with system vendors and researchers to upgrade EMS technology. Enhancements must be developed to improve alarm filtering, alarm display, inter-grid data sharing, system modeling and reliability analysis tools. This is especially true as ISOs grow in the scope of power systems under their management and operators are tasked with monitoring larger and larger grids.

Leveraging Existing Resources

Almost every control center deployed since the late 1980s was designed with built-in training simulation capabilities. These applications, similar to flight simulators used by airlines, simulate the transmission grid and give control room operators the chance to practice responding to failures and outages. The drawback to these simulators is that they require not only an upfront financial investment by the utility but also an ongoing commitment and budget to make use of them.

Most systems need engineers to plan and set up the simulation, which is often carried out during an extra shift. Such expenditures have been cut from the budgets of many utilities. KEMA is conducting a benchmark study of this situation and has found that a significant fraction of transmission companies are not fully using the simulation applications in their existing EMS.

Utilities, however, may soon have no choice but to invest in these training exercises. One response to the blackout that is being discussed is whether operator certification (today a written NERC test) should include periodic simulator training as is required of airline pilots and nuclear plant operators. In addition, utilities are likely to

find they must hire third parties to audit control room training and simulation exercises that meet tightly regulated standards.

The whole approach to monitoring transmission grid reliability in real time and in preparing operational plans a day to a year ahead of time will also come under scrutiny. Utility operations may be able to borrow a page from the Enterprise Risk Management practices of the financial industry.

Banks assess their financial risks by examining the historical ebbs and flows of the markets that impact their business and their investment portfolios. These variations occur with somewhat predictable frequency on cycles throughout the day, month and year. Based on historical occurrences, banks keep extra capital on hand to cover those risks during the specified periods. Transmission companies have typically done the same thing by ensuring that excess energy is available during predictable peak periods of demand.

But banks also employ global risk assessment strategies to account for failures outside of market forces. For instance, a rogue bond trader or a human error can literally cause a financial crisis overnight, which absent regulatory intervention could trigger a domino effect of failures. Because such events are rare, there is no published set of statistics to use in quantifying the risk as there are available for estimating market price induced risk.

The financial community recognized this flaw and began sharing data on unpredictable incidents so that statistics could be developed to calculate risk. Banks, as a result, now keep money in reserve to compensate for the unpredictable and a body of theoretical work and policies are developed to deal with what is called "operational risk". Transmission companies can borrow this strategy for many of the same reasons. Instead of looking at the first "credible" contingency, many more and more incredible contingencies should be examined, and more importantly, operations should consider the underlying events that can trigger multiple contingencies and plan for them. Transmission lines that share right of ways are vulnerable to common root causes from vegetation to helicopters; substations are especially vulnerable when work is going on in them, and so on. (Admittedly, many operations do carefully look at issues arising from shared right of ways, but it is not common practice to focus reliability analyses on the potential impacts of crew errors while working in a substation.)

To highlight this point, the August 14 blackout is considered a rare event. But was it really? Italy experienced a remarkably similar outage last summer that was brought on by many of same factors – deregulation and operator error – that caused the North American event. So, two once-in-a-lifetime blackouts occurred in the same summer. What are the odds of that? Perhaps better than anyone imagined.

These events underscore the fact that the current states of energy markets worldwide have changed the definition of acceptable risk. This points to the need for more effective use of online state estimation and contingency analysis models within the EMS. For those utilities actually still using them, these models take measurements of network conditions and continuously analyze what-if scenarios.

There are currently two problems with the ways these models are used. First, they are not kept up-to-date on the existing configuration of the transmission network. As with simulation, maintaining these models requires constant investment. Generally speaking, one operations engineer must dedicate about 20 hours a week to keeping the analysis models updated. While more utilities are continuing to make use of these tools than have kept their training simulators in use, there are some that have scaled back staff budgets and focus under the assumption that "the ISO is doing that now."

The other limitation is computer power. The traditional life cycle for an EMS has been 10 years and there are more than a few that were first contracted for in the late 1980's still operational. As a result, online state estimation models may be run infrequently and online security analyses are restricted in the number of contingency scenarios they can analyze. Out of habit, most utilities select the 50 risk issues concerning them the most and include them in the modeling. Recent history and the concept of global risk assessment, however, have taught us that even the most unlikely failures must be considered.

Today the software and hardware available in EMS systems is capable of far better, and the capital outlays for a new EMS are dramatically reduced over what was required 10 years ago. As with past blackouts, we should expect this one to lead to a flurry of EMS modernization.

Enhancing EMS Technology

Recent outage events have demonstrated that analytical tools monitoring conditions in the grid and algorithms modeling network performance can fail under extreme situations. They were not designed to model the kinds of severely depressed voltages and overloaded circuits that many grids now experience. The load flow algorithms available to the industry until very recently were unable to converge reliably when system voltages were depressed. This made it difficult for contingency analyses to accurately predict the

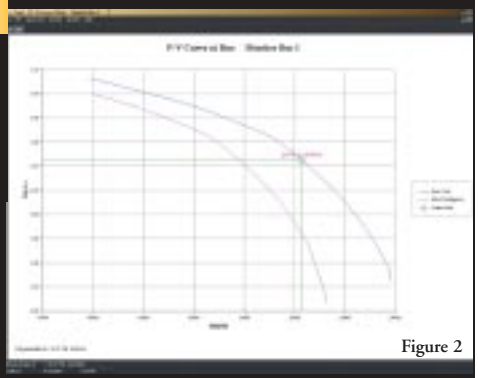

Figure 2

The VSA application should be executed periodically and uses the State Estimation solution as the current operating point. It continuously evaluates and displays to the operator the margin to the critical point. In addition to the prediction of this critical point, VSA determines the weakest load flow busses in the system that exhibit the worst voltage drops, thus contributing to the collapse (Figure 2). The operator can monitor the voltage of these critical busses against voltages of these busses corresponding to the critical point to determine how close the current operating point is to the possible collapse point.

Since the collapse is related to not having enough reactive power to support the voltage, monitoring the reactive power reserve and maintaining the required reserve in the right area will prevent possible voltage collapse. VSA provides displays showing the current reactive reserve and the critical reactive reserve (corresponding to the critical point).

VSA can be set up to determine the operating limit for the flow gates, which are interfaces where major power is imported. This application can be executed in study mode to determine preventive actions. VSA can be executed in a day-head schedule to ensure there is enough margin to critical point for all 24 hours of the next day as part of determining the day-ahead schedule in the power market design. ABB's VSA has been tested with large models and is being field tested in several EMS projects.

-- Mani Subramanian, Director, ABB Network Management, Sugar Land, Texas.

final outcome of severe outages, especially when systems are heavily loaded. The more detailed transient simulations required to assess these cases were computationally too cumbersome to be practical for online use. This is a case of "when you need it the most is when it can't be counted on to work" – an unacceptable situation. New algorithms and new research are required to address this fundamental problem.

Voltage instability or voltage collapse is one of the important grid reliability factors contributing to major blackouts that must be detected earlier. If this voltage instability can be predicted against all possible contingencies in advance, taking preventative steps to avoid the occurrence can protect grid reliability. One vendor that has already introduced this type of new technology is ABB, which recently unveiled its Voltage Security Assessment (VSA) application to detect voltage instability. *[See sidebar].*

The first technological step for the industry to take, therefore, is to upgrade EMS algorithms and models to operate under a broader spectrum of grid conditions and to simulate the once-in-a-lifetime outage scenarios that most operators believe could never strike their utility. KEMA and others have suggested that contingency analyses and operational planning should shift from the "N-1 " model to a stochastic model that considers a wider range of possible events in a probabilistic framework. Such an approach would produce an assessment of the likelihood of major problems that could be used in a risk-cost tradeoff, for instance, in determining whether and how much load to shed in rotating brownouts and black-outs.

Some EMS vendors are already working on this objective, and the U.S. Department of Energy plans to fund research into improved network modeling tools.

The next step that must be taken to enhance control center technology involves alarm systems. Current EMS technology can't always process the number of alarms coming into the control center during a major failure. These systems must be upgraded to handle ten times their current alarm processing capacity. Once the EMS system can handle the large flood of alarms, the next problem is that the human operators have to be able to handle them intelligently – it is no good to overwhelm the operator with more alarm messages than can be read in a day.

Alarm filtering is a hot topic that many EMS vendors have begun considering. The concept is for the system to recognize only the most crucial alarms and forward them to the operator to deal

with. Other secondary, tertiary and repeat alarms will be suppressed and logged for later analysis. More valuable analysis of root cause and probable cause can be performed using Rule based, inference engines, and fuzzy logic as are widely used in other process industries. The industry can expect improved filtering and suppression capabilities in the near future.

Another drawback to existing alarm systems is their presentation to the control room. In most cases, alarms signal audible warnings and scroll text messages across the operator's computer screen. One line diagrams of the transmission grid and the substations show flashing breaker symbols or analog flow and voltage readings. Even with just the prioritized warnings onscreen, the operator can be inundated trying to read the messages and relate them to what is occurring in the network. For this reason, EMS developers need to borrow graphical representation techniques commonly used in geospatial applications to visualize incidents and locations. While the full graphics displays in today's EMS systems are better looking and more interesting to use than those of 15 and 20 years ago, the fundamental concepts have not changed or significantly improved in all that time.

The previous major blackouts of 1965 and 1977 both triggered rounds of investment and R&D in system operations. The 1965 blackout led to major developments in network analysis and a wave of control center investments in state estimation, contingency analysis and improved measurement and telecommunications. The 1977 outage led to investment in training simulator technologies and usage. But during the 90's the rate of investment in new capabilities slowed and the EMS R&D dollars went to porting the same functionality to new computer platforms – to UNIX and to full graphics displays. And in the late 90's and early years of the millennium, all the development emphasis has been on tools for market operations.

Conclusion

In the short term, the industry will respond to the blackout with new policies and procedures for system planning and operations. The investments will be in people, policy, and process. The focus will have to be on making better use of already deployed technologies. This phase is already well underway and will accelerate during 2004 and 2005. The second phase will be an investment in new capabilities in control rooms, more communications, and better control. Some utilities are already making plans this year for projects to begin late in the year or next year and we can expect this activity to increase. R&D organizations from DOE to EPRI to vendors and universities are turning their attention to needed new solutions. The third phase of response, actual investment in the grid and in new transmission technologies, will take longer to bring about due to broad issues of funding and approval cycles. ■

ABOUT THE AUTHOR

Ralph Masiello is Senior Vice President, Energy Systems Consulting with Burlington, Massachusetts-based KEMA Inc. Mr. Masiello has over 20 years experience in transmission and distribution operations, implementation and control systems at many of North America's largest utilities, energy scheduling and optimization, and control center projects, including the setup of systems for energy markets and ISOs around the world.
Mr. Masiello can be reached at: rmasiello@ kemaconsulting.com.

The Myths and Realities of
Arc Flash Protection

By: *Thomas E. Neal, PhD & Randell B. Hirschmann*

Arc Flash safety has become as important a topic in the industry as electric shock protection. Few electrical workers would consider working on a 13.8kV system without their proper voltage rated gloves. Similarly, many workplaces are looking towards their consultants, electrical engineers, clothing manufacturers and the standards for guidance on creating an Arc Flash safe workplace. However, there are several myths, which need to be addressed:

MYTH: Arc Flash explosions do not happen… I have never seen one.

REALITY: Hopefully, most electrical workers will never see and an flash accident. However, electrical work by nature is dangerous due to the high energy levels involved and the fact that until an accident occurs, electricity is odorless, colorless and essentially invisible. Electrical workers have chosen the third most dangerous profession according to recent OSHA statistics. There are 10 OSHA reportable Arc Flash incidents involving more than one fatality **everyday in the USA.** Studies indicate that up to 80% of all Electrical Worker injuries are not due to shock (passage of electrical current through the body) but due to external burn injuries created by the intense radiant heat energy of an electrical arc explosion.

MYTH: There is nothing anyone can do to protect against an Arc Flash explosion

REALITY: There is a great deal that can be done to prevent an Arc Flash explosion and to protect personnel if they are exposed to an Arc Flash. The National Fire Protection Association (NFPA) developed NFPA 70E "Standard for Electrical Safety in the Workplace" to reduce the number of accidents which occur in the workplace. The standard provides guidance on Personal Protective Equipment (PPE) selection to greatly reduce or avoid injury in the event of an Arc Flash accident. An Electrical Safety program is like the four legs of a chair… each one indispensable to a safe workplace:

- A knowledgeable electrical worker, qualified to perform the task
- Safe work practices & procedures in place to reduce the likelihood or severity of an injury
- Engineering Controls (Hardware) in place to reduce the extent/level of the hazard
- Personal Protective Equipment, including clothing and gloves, to protect the worker in the event an arc occurrence

Removal of any one of the "legs of the chair" could lead to severe injury and death.

MYTH: Will Street Clothes made of cotton or other natural fibers protective me?

REALITY: Cotton and wool definitely are flammable fibers and can ignite if exposed to the intense radiant energy of an Arc Flash. When clothing ignites and burns on the wearer's body, large areas of the body surface can sustain 2nd and 3rd degree burn injuries. Burn injury can take place in portions of the body that were not initially exposed by the arc. As the combustion of cotton or other flammable clothing continues to spread to additional areas of the body, the extent of the burn injuries increases. Flame Resistant (FR) clothing which meets the requirements of ASTM F1506 and NFPA 70E will not ignite and continue to burn on the human body, and can additionally provide thermal protection for the areas of the body that it covers. Multiple layers of lightweight fabric can be designed to provide the level of protection needed to address a wide range of Arc Flash hazards. The NFPA 70E standard provides guidance on how to select the appropriate PPE, which matches the level of the Arc Flash hazard determined for the electrical task being performed.

Images taken from Oberon Company's PCIC Arc Flash Tour Video

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MYTH: Spectacles and Sunglasses will protect me from the heat of an Arc Flash exposure

REALITY: There are many types of safety spectacles and sunglasses. None of these have been assigned an Arc Rating. The actual surface area protected by a pair of spectacles is quite limited (only a small fraction of your face). Because there is no Arc Rating, the user cannot know what protection is provided. Only an Arc Rated Faceshield or Hood can provide a designated level of protection against the thermal energy of an electric arc and be matched to the Arc Flash hazard determined for the task being performed.

MYTH: I wear a faceshield… that should be enough

REALITY: It depends upon the faceshield. In the marketplace, there are some Arc Rated Faceshields. Arc Flash faceshields are required to be tested to ASTM F2178 test method to determine their arc protective rating. Arc Rated Faceshields are typically used for electrical work where the hazard is below 8 calories/cm_2 or NFPA 70E Hazard Risk Category #1 and #2. However, many in the industry continue to use clear polycarbonate faceshields as arc flash protection. Oberon conducted research in 2003 on Clear Polycarbonate faceshields and determined that clear face shields or clear hood windows do not offer any significant degree of protection for the face during an arc flash event. The reason for anecdotal evidence regarding protection provided by clear shield windows remains unclear. There may be cases in which a worker was facing away from the arc source when the arc flash event occurred. Or the face area may have been exposed to lower levels of incident heat energy than other parts of the body giving the impression that a clear shield window had provided protection. Whatever the case, arc flash testing indicates that even at the very low exposure level of 2.7 cal/cm^2, the eye and mouth sensors of the test apparatus headform indicate a 2nd degree burn injury.

MYTH: I wear a faceshield… when would I need a hood?

REALITY: An Arc Rated faceshield provides effective protection for the areas that it covers, i.e. the face and to some degree the frontal neck area. Depending on the design, convective heat can travel under the face shield and cause burns even to the face especially for higher-level Arc Flash exposures. Of course, a face shield cannot protect the sides and back of the head or the neck. An Arc Rated Hood provides uniform protection for the entire head and neck. Further, the use of an Arc Rated faceshield is limited to tasks designated by NFPA 70E Hazard Risk Category (HRC) #2. For tasks designated by HRC 2*, HRC 3 or HRC 4, the use of full hood is required.

MYTH: FR Clothing is all the same.

REALITY: There are two basic types of FR Clothing.

- Flame Retardant Treated (FRT) clothing, which is simple cotton made flame resistant due to a flame retardant chemical treatment applied to the fabric

- Inherently Flame Resistant clothing, which is made from fabrics and fibers with a chemical structure that will not burn in air.

It has been shown that the FRT Cotton clothing can lose their flame resistance if laundered incorrectly, e.g. with a bleach. With inherently FR clothing, there is no treatment so there is nothing that can be washed off.

MYTH: ATPV = 100% Protection

REALITY: The definition of Arc Thermal Protective Value (ATPV) recently approved for arc test method ASTM F1959 is "the incident energy on a fabric or material that results in a 50% probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second-degree skin burn injury based on the Stoll1 curve." The revised data analysis method also provides the incident energy in cal/cm2 for lower probabilities of the onset of a 2nd degree burn injury, e.g. from a 40% probability down to a 1% probability of sustaining a burn injury. While most people would not consider a 50% chance of injury to be sufficient protection, limiting the use of a garment to the better protection probabilities, and their corresponding energy levels, will reduce your chance of burn injury.

MYTH: Aluminized clothing is an effective choice for protection from Arc Flash hazards.

REALITY: Aluminized clothing does work effectively to block radiant energy from an Arc Flash event; however, since aluminum is a good conductor of electricity, the aluminized fabric can increase the probability of an Arc Flash accident. Oberon has demonstrated in the Kinectrics arc-testing laboratory that aluminized fabric can act to initiate an arc by reducing the air gap between the electrodes used in the ASTM F1959 arc test method. Similarly, aluminized fabric could cause the initiation of an arc accident by reducing the air gap between conductors in electrical equipment.

MYTH: I am confused by the Table 3.3.9.3 in NFPA 70E. What exactly is a Hazard/Risk Category?

REALITY: To identify ranges of hazards, NFPA created Hazard/Risk Categories. This was intended to make the selection of PPE simpler for the consumer. However, the Table 3.3.9.3 in the previous version of 70E seemed to create more confusion for the users than clarification. The table identifies energy levels corresponding to each of the 4 Hazard/Risk levels. Unfortunately, it goes further to state minimum energy levels or Arc Ratings. Did the Table mean that the hazard has a minimum energy level or the clothing has a minimum protection level?

The fact is the table was identifying the minimum protection level offered by clothing for each Hazard/Risk Category (in the case of HRC #3 = 25cal/cm²) for maximum task energy levels (25cal/cm²). In other words, if the task you are performing in classified by the NFPA 70E tables as a HRC #3, this means the task has an energy level less than 25cal/cm². To insure your protection, you must use, according to NFPA 70E and Table 3.3.9.3, Arc Rated Hood and Clothing with a minimum Arc Rating of 25cal/cm².

NFPA 70E Table 130.7(C)(11) (Simplified)

Hazard/Risk Category (HRC)	Required Minimum Arc Rating of PPE
0	--
1	4 cal/cm²
2	8 cal/cm²
3	25 cal/cm²
4	40 cal/cm²

If you conduct your own hazard analysis for a task, which is preferable since it is more representative and accurate for the task in your work place than the NFPA 70E table can be, then PPE can be selected with an arc rating in excess the hazard level of the task to be performed.

Fortunately, the table has been rewritten in the new version of 70E to be clearer. In the new 2004 Edition of NFPA 70E, the same Table which is now designated Table 130.7(C)(11), the description has been changed to "Required Minimum Arc Rating of PPE (cal/cm²)". With this new wording, it will hopefully be clearer to the users of the standard.

Many excellent resources are available to assist you in your efforts to create a safe workplace. First, NFPA 70E standard itself can be purchased from the NFPA website. The standard is available in English and Spanish! There are seminars covering Arc Flash standards and workplace safety. Additionally, there are consultants & software to assist you in your hazard assessment, identifying the level of hazard of your particular task(s). "Safety is no accident" is an expression often used. Knowledge, training and proper PPE can make the difference between going home for dinner … or not.

The Oberon ArcTrainer CD-ROM, covering the Electrical Safety Standards and Arc PPE can be ordered FREE over the Internet at http://www.arcflash.com/elecCD ■

ABOUT THE AUTHOR

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

Thomas E. Neal, PhD (Neal Associates Ltd) was the Technology Manager of DuPont's Thermal Testing Laboratory from 1994 through 1999. He has over twenty-five years of experience in high performance fibers, fabrics and protective clothing. He has been a leader in the development of industry standards related to electric arc flash hazard analysis and the application of flame resistant protective apparel for arc flash and flash fire hazards.

Copies of the NFPA 70-2000 Standard can be purchased directly from NFPA at the web site http://www.nfpa.org/catalog *(Search for 70E04 for English version of 70E-2004 or 70E00E for the Spanish version of 70E-2000).*

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

Footnotes:

[1] Derived from: Stoll, A.M. and Chianta, M.A., "Method and Rating System for Evaluations of Thermal Protection", Aerospace Medicine, Vol 40, 1969, pp. 1232-1238 and Stoll, A.M. and Chianta, M.A., "Heat Transfer through Fabrics as Related to Thermal Injury", Transactions – New York Academy of Sciences, Vol 33 (7), Nov. 1971, pp. 649-670.

2004 T&D WORLD EXPO SCHEDULE AT A GLANCE

MAY 25-27, 2004

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MONDAY May 24	9:00am to 5:00pm	**W01** Distribution Reliability: Costs, Risks and Customer Expectations — Richard Brown, KEMA, Inc.	**W02** Distribution Automation: Lessons Learned — James Evans, The St. Claire Group LLC
TUESDAY May 25	9:00am to 10:00am	**(KEY) KEYNOTE ADDRESS:** In Pursuit of a Reliable and Stable Grid System OR In Pursuit of a	
	11:00am to 12:00pm	**T101** RTOs: An End User Perspective — John Hughes, Electricity Consumer Research Council	**T201** In Pursuit of the Interconnected Power Grid: The Mediterranean Ring Example — Charles W. Newton, Newton-Evans Research Company, Inc.
	1:30pm to 2:30pm	**T102** Reliability Optimization and Assessment — Wade Freeman, Ontor Utility Solutions	**T202** Synchronizing Data for Power System Analysis in GIS — Farrokh Shokooh, Darcy Braun, Alok Gupta, Operation Technology, Inc.
	2:45pm to 3:45pm	**T103** Privately Owned and Operated Transmission Lines — Jose Rotger, TransEnergie US	**T203** Optimizing T&D Performance: Physical and Human Assets — Terry Tyler, IBM Corporation
WEDNESDAY May 26	8:30am to 9:30am	**T104** Aging of the Transmission System and Its Impact on Reliability — E.I. Goodwin, EPRIsolutions, Inc.	**T204** Assess and Analyze Your Distribution System Using All Available Data — Debra Henderson, ITRON, Inc.
	9:45am to 10:45am	**T105** Uprating and Upgrading of Overhead Lines — Jose Daconti, Power Technologies, Inc.	**T205** SCADA/AMR Convergence: Integrating Telemetry and Monitoring Devices into the Enterprise — James Bales, IBM Corporation
	11:00am to 12:00pm	**T106** Reliability and Responsibility Issues of Animal Mitigation — Michael Stine, Tyco Electronics	**T206** EMS/SCADA/DMS Attitudes and Plans Among Operations and Engineering Managers — Charles W. Newton, Newton-Evans Research Company, Inc.
	1:30pm to 2:30pm	**T107** Meeting the Market Demand for Transmission Expansion — Steve McGee, Power Delivery Associates, Inc.	**T207** Transmission Asset Management Strategies and Tools — Wesley Wilson, Public Service Company of New Mexico
	2:45pm to 3:45pm	**T108** Investment in Transmission: Why It Must Return — Dale Landgren, American Transmission Company	**T208** Pole Attachment Regulation: Opportunities and Challenges — Thomas B. Magee, Keller and Heckman LLP
THURSDAY May 27	9:00am to 10:00am	**(GNS) GENERAL SESSION:** Understanding and Avoiding Lawsuits: Views from a Forensic Exper	
	11:00am to 12:00pm	**T109** Maximize the Capacity of Your Transmission Lines — Tapani Seppa, The Valley Group	**T209** Leveraging the Value of a Strategic, Integrated Approach to Vegetation Management — Todd Horton, BASF Professional Vegetation Management
	1:00pm to 2:00pm	**T110** Upgrading System Capacity and Reliability Along the Wasatch Front — Curtis Mansfield, PacifiCorp; Karl Miller, Kenny Construction Co.	**T210** Transmission Project Life Cycle: Streamlining the Process — Jerrod Snyder, Fred Behrmann, ITRON, Inc.
	2:15pm to 3:15pm	**T111** Building the Transmission Network: Past, Present, Future, or Maybe Never — Leonard Hyman, R.J. Ruden Associates, Inc.	**T211** Power Quality Monitoring: A Utility Concern and a Customer Reality — Daniel Sabin, Electrotek Concepts

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9:00am to 1:00pm	**W03** **Partnering and Outsourcing: The Keys to Client-Contractor Success** Patrick Hurley, James Carter Navigant Consulting, Inc.	**W04** **New Alternatives in Overhead or Underground Transmission: A Look at the Options** Earle C. Bascom, III, Dale Douglass Power Delivery Consultants, Inc.	**W05** **Distributed Generation: The Promise and the Peril** Murray Davis, DTE Energy Technologies Haukur Asgeirsson, Detroit Edison
2:00am to 6:00pm	**W06** **Asset Management** Laurie Oppel, Daniel O'Neill, Charles Fijnvandraat Navigant Consulting, Inc.	**W07** **Power Quality Options: Solutions to Common Problems** Phil Barker NOVA Energy Specialists	**W08** **Getting Extra Capacity from Overhead Lines** Dale Douglass Power Delivery Consultants, Inc.
	National Energy Policy – David Nevius, Senior Vice President, The North American Electric Reliability Council (NERC)		
	T301 **Improving the Distribution Substation Design & Operations** Gene Wolf Public Service Company of New Mexico	**T401** **Improper Investigation, Instrumentation and Interpretation of Soil Thermal Resistivity** Deepak Parmar Geotherm, Inc.	**T501** **Evaluating Hidden Failures in Protection Systems** David C. Elizondo MPR Associates
	T302 **Market-based RTOs and System Expansion Planning** Kenneth Laughlin PJM Interconnection	**T402** **Condition Assessment of Transmission and Distribution Class Voltages Cable Systems** Nagu Srinivas DTE Energy Technologies	**T502** **Lightning Protection of Sub-Transmission Power Lines** M.M. Drobkin, Roy B. Carpenter, Jr. Lightning Eliminators & Consultants, Inc.
	T303 **Substation Integration and Automation: Diagnostics and Monitoring** John McDonald KEMA, Inc.	**T403** **Underground Cable Rating: Increasing Capacity Using Existing Cable Circuits** Earle C. Bascom, III Power Delivery Consultants, Inc.	**T503** **Methods of Delivering Major Projects** Chair: Michael Beehler Burns & McDonnell
	T304 **On-Line Diagnosis of Power Transformers Using Acoustic Emission** Arturo Nunez, Samuel Ternovchek Quality Services Laboratories	**T404** **An Introduction to Nanotechnology** Michael Beehler Burns & McDonnell	**T504** **RTO Technology Vision** Stephen Callahan IBM Business Consulting Services
	T305 **Secure Plant Infrastructure Through Remote Substation Monitoring** Jeff Baumer MiniMax Corporation	**T405** **Damage Prevention: Current Trends in Underground Utility Protection** Rich Maxwell Contributing Technical Editor - T&D World Magazine	**T505** **Siting New Transmission Lines: Electric Power Research Institute Methodology** Jesse Glasgow Photo Science, Inc.
	T306 **Security Challenges in the Electric Utility Industry** Cory Cipra, Tobias Whitney Burns & McDonnell	**T406** **Fiber Optic Transmission Conductor with Distributed Temperature Sensing** Shan Nandi Exelon Corporation	**T506** **Grounding Equivalency of Steel Poles** Dr. J. P. Donohoe - Mississippi State University **Corrosion Performance of Galvanized Steel Poles** Thomas Kimstler, GalvaScience, Inc.
	T307 **Deregulation in Today's World: Where is it Succeeding?** Dr. Lynne Kiesling IFREE	**T407** **Pro-Active Partial Discharge Testing of Underground Power Cables** Matt Mashikian IMCORP	**T507** **Distribution Capacitor Reliability and Changes in Fusing Practices** Thomas Short EPRI PEAC
	T308 **Connection of Two Voltage Points in Distributed Network by Use of the Energetically, Reliable and Economic Criterion** Dr. Damir Pecvinac Croatian Power	**T408** **EHV Underground Transmission Systems in North America** William G. Hansen Power Engineering	**T508** **SCADA Frame Relay Network Lessons Learned at Erie Blvd. Hydro Power from the 2003 Blackout** Eric Heldt Reliant Energy
	– John J. Nicholas, President - JNJV Consulting		
	T309 **Life-Cycle Decision Making for the Electric Power Delivery Industry** Danje Nikolic EPRIsolutions, Inc.	**T409** **Galvanize It!: An Educational Seminar on Hot-Dip Galvanizing for Corrosion Protection** Matthew Stenzel American Galvanizers Association EARN CAT/ITSY	**T509** **Hidden Failures in Protection Systems Reliability: The Next Incremental Step** Mike Marshall, David Farmer Synergetic Design
	T310 **Integrating Customer Consumption Data with GIS and SCADA Data to Optimize Circuit Utilization and Prevent Device Overloading** Rick Brakken, ICF Energy Solutions Kip Sikes, Idaho Power, Steve Steffel, Connectiv Power Delivery	**T410** **Fast Track to Increased Capacity** John Lionberger Burns & McDonnell	**T510** **Review of Load Tap Changer Filtration Program at Oklahoma Gas & Electric** Fred Winnard, Oklahoma Gas & Electric Terry Oliver, Kal Farooq, Pall Power Generation
	T311 **Super Condensers for Dynamic VAR Support in an Electric Grid** Swami Kalsi American Superconductor Corporation	**T411** **Cost of Corrosion in the Electric Utility Industry** Cris K. Conner Utility Service & Maintenance, Inc.	**T511** **Fiberglass Standoff Degradation and Flashover Mechanisms** David Crudele EPRI PEAC

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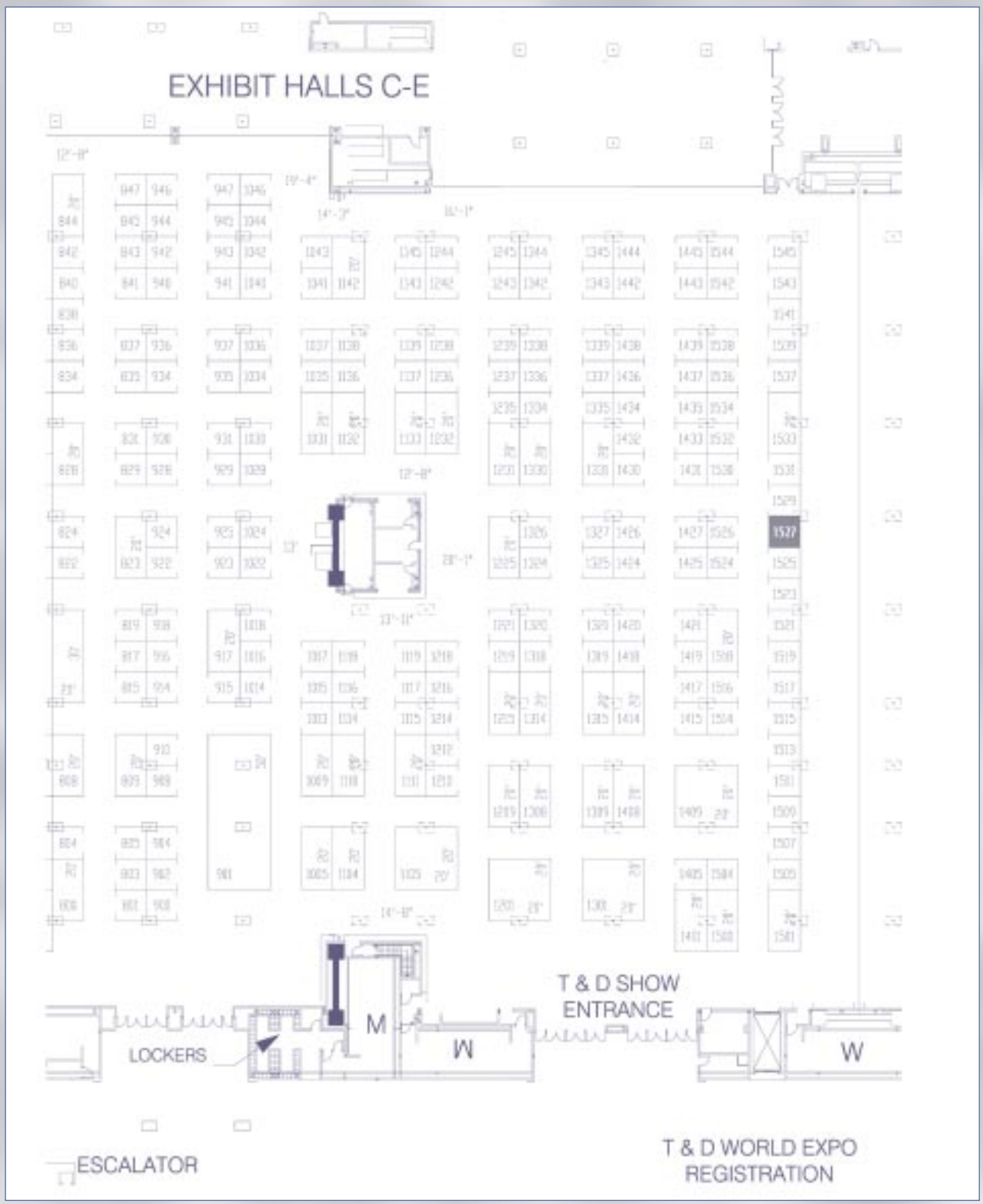


Testing Advanced Digital Relay Systems

By: Drew Welton
Sales and Application Engineer
OMICRON Electronics Corp.

Digital technology in protective relaying has come a long way in it's acceptance with utilities and industrial power producers world-wide over the past decade. Reliability, cost efficiencies, and advanced application capabilities continue to improve in these high-tech packages. Manufactures who design and produce these systems continually boast about reliability, and how self-diagnostics can warm the user in the event of relay failure. How true are these claims? Does this mean we no longer need to be concerned with the testing process?

While it is true that self-diagnostics will detect and alert the user to catastrophic failures in the microprocessor, it is the unseen that posses the biggest threat. Self-diagnostics can not detect the health of a dry contact, or the performance of a CT or PT, but most importantly, you will never be alerted to an incorrect function setting or logical configuration. As you may have guessed, through relay testing is more important than ever, but we must take a slightly different approach.

When testing single function relays, we are typically concerned with two basic fundamental testing criteria: pick-up and time delay. These are relatively simple procedures for the relay technician by creating a single timed shot test, and a simple ramp test to validate the pick-up, moving from one relay to the next. The main focus with testing electromechanical relays are issues surrounding calibration.

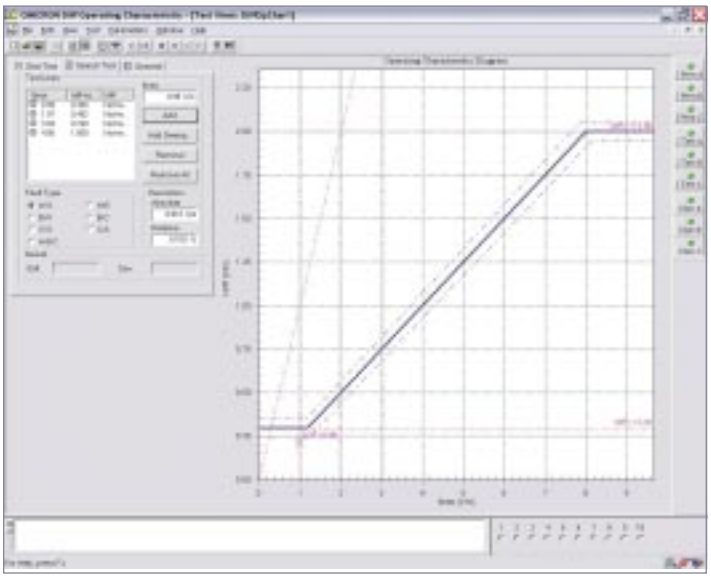
As most technicians will confess, this process becomes difficult when applied to multifunction digital relays, where as calibration is no longer the focus, rather, a validation that relay function and logic are set correctly. First, you will find many relay functions have multiple settings and time delays, as well as functional logic, such as sensitivity to breaker position. Second and more importantly, is that testing one element can often cause another to respond, interfering with the assessment. Most relay manufacturers suggest disabling the functions not presently being tested. This is where the danger comes in to play.

As an example, lets look at a multifunction relay for generator protection. As you apply voltages and current to the relay, you notice the inadvertent energizing element interferes with your assessment, so you temporarily disable it. If you forget to re-enable the function, or enable it with the incorrect setting or functional logic, you run the risk of leaving the most expensive piece of equipment on the power system unprotected. As expected, no self-diagnostics I know of will alert you to this problem. **You must test a relay system as a system, as it will be installed!** The big question is how.

The first step in testing any new relay, single or multifunction, is a complete understanding of the relays functionality by the person developing the test. Most modern protective relay systems utilize setting software that allows a better picture of how the relay should function, and allows easy display of function settings and logic. Using a computer to interrogate the device has distinct and obvious advantages over attempting the same via a front panel display. Unfortunately, inadequate testing is often a result of lack of understanding the device being tested. The old adage, "Read the Instructions" comes to mind as an important first step. Most relay manuals provide enough information regarding the operation and applications to understand the functionality, but again, be cautious of test procedures that call for relay setting changes after the testing process.

One way of avoiding interfering functions when testing a multifunction relay is to utilize output functions not designated for use after installation. If, for instance, checking an overcurrent element causes a differential element to trip, interfering with the assessment, the overcurrent element can be mapped out to a contact utilized for only testing purposes. You will also want to map the test function to the main output contact, and set and "and" gate in your test plan to properly asses both the test output, and the main one as well. Simultaneous ramping of multiple CT inputs to verify overcurrent elements will also avoid interference from a differential element as well. This approach is most efficient if two 3-phase sources are available.

It is equally important to verify correct logic settings in a multifunction relay. Communication schemes, breaker failure logic, reclosing functions are all examples of relay functionality that is often missed. One important process during testing is to provide breaker simulation to the relay, if any protective functions are subject to breaker position. Many times, especially for motors and generators, protective elements are enabled only when the main breaker is closed. Verifying that the element only responds during this condition will avoid



nuisance trips, and even costly outages due to incorrect relay logic. Modern test equipment allows for easy configuration of breaker simulation.

Dynamic testing of a relay often refers to applying a simulated fault to the device, that would mimic an actual fault the relay may see when in service. This can be accomplished by executing a Comtrade file with a test set, and verifying the test results, comparatively with the fault records in the relay. This is becoming a popular method of testing modern relays, but can be difficult due to the number of test files that must be created and executed to validate all relay element settings.

Modern three phase relay test sets, that are also computer controlled offer the best solution for technicians faced with advanced multifunction relay systems. The ability to create dynamic test situations, that validate actual settings, and system logic can save time, and give technicians and relay engineer's peace of mind that the relay system will respond correctly when in service. Often times, it would appear as if the use of a personal computer is not so desirable for those not familiar with their use. Relay testing personnel who have used manual testing for years often equate computerized testing to be difficult and inflexible. While this may have been the case with early computerized testing methods, huge advances have been made that provide anyone with relay knowledge to create and execute a relevant test procedure.

Changing relay settings for the purposes of testing is not a procedure brought on by modern digital relays, it was common practice with some electromechanical devices as well. The main reason being that it was too difficult to manually calculate correct simulated fault values for multiple setting combinations. The obvious problem with this practice is not replacing the setting back to the operating position when placed into service, causing potential misoperation. Once again, modern test equipment software should calculate appropriate test values based upon relay settings, allowing for easy testing of complex relay elements.

Relay test set manufactures can provide significant information with regards to modern relay testing techniques. If, as a relay engineer or technician, you are relying on single phase, manual test systems to test modern 3-phase, multifunction relays, chances are you are not doing what is necessary to avoid problems in your protective relay system. ■

ABOUT THE AUTHOR

Drew Welton is a Sales and Application Engineer for the southeastern region of the US, with OMICRON electronics Corp., USA, a company that designs, manufactures, and sells electronic test equipment for the power industry. He is a graduate of Fort Lewis College, Durango, CO, and a long time member of IEEE. Prior to OMICRON, Drew was an Application Engineer for protective relays, and relay systems, at Beckwith Electric, and Regional Sales Manager for the Western US. He has also served as an instructor at hands-on relay schools at Washington State University, and University of Texas, Arlington, as well as relay training sessions at various utilities and relay testing companies in the southeastern region of the US.

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In this Issue

Taking Wireless by Storm

By: Mark Ferguson, Padcom, Inc

Halfway through September 2003, the second major hurricane of the year, Hurricane Isabel, swept across the U.S. Central East Coast's Outer Banks. This Category 3 hurricane moved through six states with maximum sustained winds of 115 mph.

Isabel bypassed the service territory of South Carolina Electric & Gas Company (SCE&G), a wholly-owned subsidiary of SCANA Corporation, but moved west-northwest hitting millions of neighboring utilities' electric customers living in North Carolina and Virginia. SCE&G has reciprocal agreements with neighboring utilities and was called to cross state lines to help with the restoration effort.

Action had to be taken quickly to help the customers in those states, and SCANA Services Manager of Customer Service Field Technology, Don Faircloth, was faced with a dilemma: provide a team, leaving in a matter of hours bound for a disaster zone, with a communication tool that could keep workers connected across state borders, despite the damaged phone infrastructure. So he called on SCANA Services CADS Project Coordinator Bill Lamprey.

"We had an old laptop on which we installed Padcom's® TotalRoam®. We set it up for Sprint (CDMA 1xRTT network) because it seemed to do best state-to-state and sent it out with the restoration team," said Lamprey. "Our intent was to allow the crew to send and receive e-mails and access the company Intranet in the field. After they came back, we found out they were using the wireless connection for activities well beyond what we were expecting."

Once in the disaster areas, the SCE&G restoration team found that this wireless link was often their sole form of communication back to headquarters. In addition to using the connection for regular communications, they used it to make material requests, to send pictures that documented the destruction and reconstruction efforts in the disaster areas, and to fill-out and file time sheets and document materials used.

This real-time documentation of the restoration was particularly valuable for SCE&G. Rather than waiting weeks to receive a report on the outside expenses of the reconstruction, the company was provided with an ongoing account of the damage and costs of restoration. These costs were then passed to the appropriate utilities promptly and efficiently.

"Communication is critical when you send crews away from home and our wireless solution kept them connected everywhere they went," said Lamprey. "I could look at my computer and see that they were online from early morning to late at night. When they got back and returned the laptop the first thing they said was *next time we want more of these.*"

Mobile Data for Day-to-Day Operations

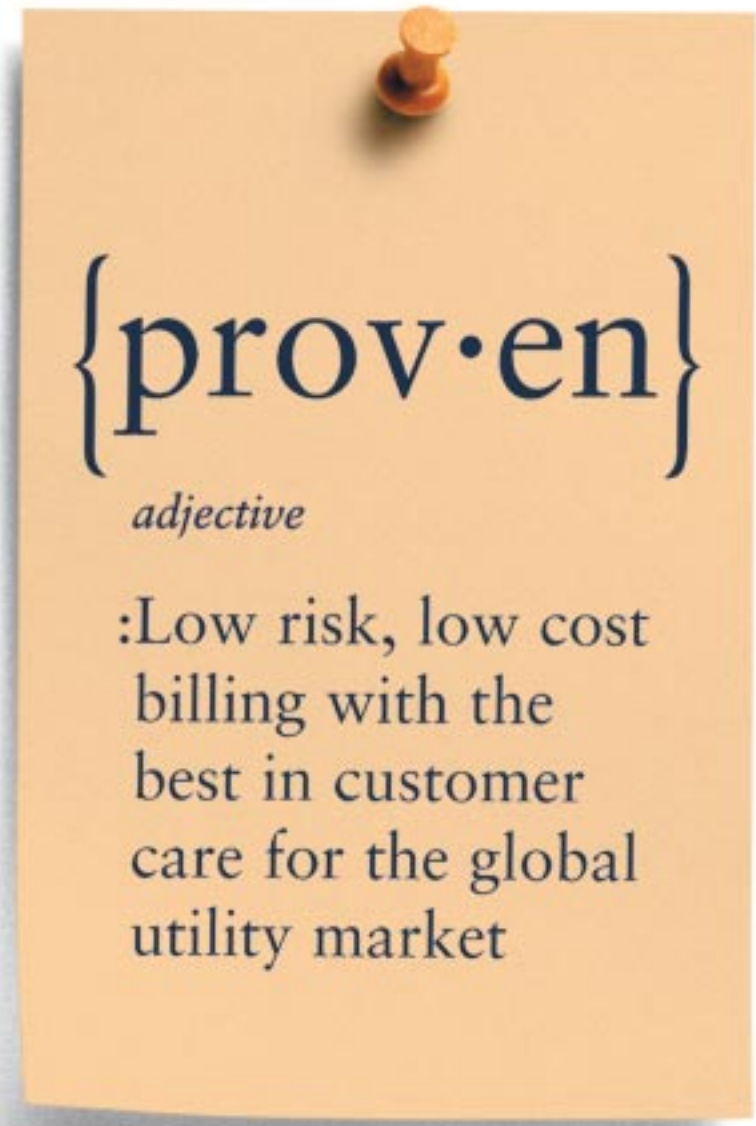
SCE&G's Hurricane Isabel restoration effort is an example of an effective use of mobile data in aiding emergency activities. Although the solution proved effective under emergency circumstances, it is SCE&G's investment in integrating wireless data into day-to-day operations that made the solution possible.

SCE&G has a fleet of over 325 field service technicians who are responsible for servicing customers and maintaining the electricity and natural gas lines in South Carolina. In order to help the technicians do their job effectively, they need access to up-to-date, accurate customer order and technical information in the field where service orders and maintenance operations are conducted.

The challenges in developing a wireless network to meet SCE&G's needs lie in the extensive area of operations. SCE&G serves customers in a statewide area. Because of the geographic diversity of the service territory, the company was unable to find a single communication platform that met the needs of technicians everywhere they did business. As a result, field technicians in different geographic locations were forced to utilize whatever communication was available in their area or, in many instances, to do without mobile data. These limited communication options hampered SCE&G's ability to roll out company-wide mobile data information.

To overcome these issues, SCE&G looked for a solution that would allow them to leverage the capabilities of many wireless networks. After evaluation of five different vendors, the company opted to implement a wireless network switching software, TotalRoam Mobile Connectivity Suite™, enabling the company to combine multiple communications platforms into a single mobile virtual network.

As part of the same initiative, SCE&G implemented XcelleNet's Afaria™ software. The software works with the networking solution to provide field technicians with access to key information and applications throughout daily operations. The application also simplifies maintenance of the



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Serving the Customer and the Bottom Line

SCE&G's mobile data solution impacts nearly every aspect of day-to-day activities by field technicians with enhanced speed, time savings, and greater accuracy. The benefits of the mobile data solution can be summarized in terms of its impact on field force productivity and improved customer service.

SCE&G uses computer aided dispatch (CAD) to handle customer service orders. These are distributed as work orders to field technicians in the appropriate geographic location. Since the work orders are distributed wirelessly, the technician does not have to drive into the office at the beginning of the day to receive a paper order. Technicians can leave from their homes and go directly to their first order.

Service order revisions are also wirelessly transferred to technicians, eliminating errors and reducing voice traffic over the radio system. These order updates are transferred in near real-time, so technicians are saved needless trips to customer sites in cases of cancelled or changed customer orders.

The most obvious benefit of CAD and mobile data is the number of productive work hours gained; technicians spend more time in the field and less time manually receiving orders and dropping off paperwork.

Another productivity benefit is a reduction in human error. Orders are validated in the field, greatly reducing the back office workload. All orders are typed into the CAD system, eliminating the possibility that a technician will go to the wrong address or be forced to rework and order because of illegible handwriting or transposed digits. Having orders typed directly into the CAD also saves time for home office staff.

Human error is reduced, and turnaround time shortened, by allowing technicians to enter orders directly into the system while in the field. For example, if a technician is sent to a customer site to investigate a potentially faulty meter and determines that the meter needs to be replaced, a meter change order can be issued and the order completed without returning to the office. As a result, the order does not linger in the system, technicians' time is used effectively, and customers are served quickly. That means increased productivity and a higher rate of customer satisfaction.

SCE&G's CAD and wireless data allows the supervisor to monitor the activities of workers in the field. Through CAD, the company tracks a time stamp of all the work that technicians do on their routes. When technicians go "en route", arrive on site, and complete orders, they key the information into their vehicle laptop and feed real-time information back into the customer system. This provides near real-time updating of the CIS system and improves customer service. This time-stamping increases accuracy in tracking order completion and also addresses regulatory requirements on natural gas service technicians.

In addition to CAD, wireless data provides electric service field technicians with ready access to technical information. Job-critical single line drawings and switching diagrams that used to be available only in hard copy are now readily accessible from the technicians' laptop. Technicians can also access current maps of the areas in which they operate, down to a district office, local office, crew quarter, and even individual substations. The maps let them easily identify customer lines and make the needed repair or maintenance. SCE&G's mobile data solution replaces the many books of technical maps that field personnel formerly needed to carry in order to identify poles and lines.

SCE&G also utilizes mobile data and CAD for revenue protection. When the company dispatches agents to investigate a potential energy theft, they are able to access their orders and remit investigation reports with the same speed and efficiency available to technicians.

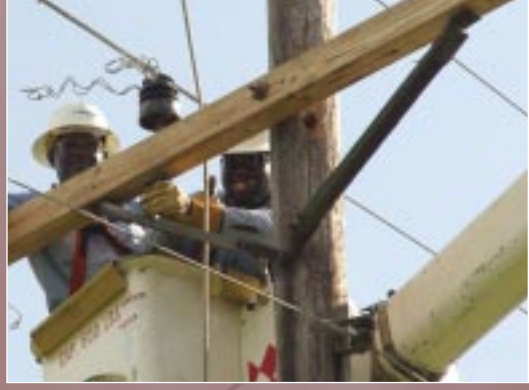
On the Horizon

SCE&G licensed their software for use throughout the company. The mobile data solution has been so effective in terms of CAD that other company divisions are currently considering how they might deploy mobile data to their own operations. Other areas of SCE&G considering incorporation of the mobile data solution include:

- Information Service Technologies (IST) is considering providing key personnel and developers with mobile connectivity so they may more effectively work offsite and continue advancing projects, even while on business trips.

- Pipeline and environmental divisions are investigating the possibilities of using the mobile data solution to aid their field workers.

- SCE&G is using the mobile data network to bring CAD to field technicians working in remote areas that previously had no access to the system due to lack of quality communications.



- SCE&G is upgrading outdated computers in their fleet and creating an intra-company, mobile data standard by putting everyone on ruggedized, pen tablet computers using the network roaming solution for CAD access.

- Wholly-owned SCANA subsidiary, Public Service Company of North Carolina, Incorporated (PSNC), is also slated to begin utilizing the CAD system. The mobile data solution will allow PSNC to utilize existing communication platforms available in NC and tie them into SCANA's CAD and CIS system.

Field technicians throughout the various SCANA subsidiaries have been very satisfied with the enduser experience of working with the mobile data solution. In addition to time-savings described earlier in this article, workers find ruggedized tablets with the mobile data software easier to initiate and use. Remote users had to go to the service trucks, initiate the VPN tunnel, and enter secure IDs to begin a user sessions over analog cellular. Now all technicians need only boot their computer and login, taking less time and providing a greater area of data coverage.

"We have found the mobile data platform with CAD to be a very useful tool for all aspects of daily operations," explained Lamprey. "Having it has been a learning experience; we are discovering new ways it can help our business every day. You never know when the next storm will strike. But when you've made the investments ahead of time to ensure mobile data availability – whenever and wherever you operate – you can rest assured that your field force will be equipped to handle anything that comes its way." ■

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Harnessing the Power of Utility Data Marts

By: Dean Zastava, Director of iAdvantage services, KEMA Inc.
and John McDonald, Senior Principal Consultant and Manager, Automation, Reliability and Asset Management, KEMA Inc.

There's no question that today's economic, regulatory and business uncertainties are challenging energy and utility executives to redefine the very foundation of their competitive value. In a market environment where even the basic rules and regulations are vague — and continually evolving — attaining and sustaining a tangible competitive advantage, while also meeting tough demands for improved reliability and customer response, can be daunting.

The many years utilities have spent redefining their business processes and the automation tools that support them have resulted in much more streamlined operations, while also significantly improving personnel productivity. Automated systems for the management of outages, customer information, work orders, mobile work forces and other critical operations have long become the norm, and investments in distribution automation have resulted in systems that operate more efficiently, with fewer outages, as well as assets that are better utilized and maintained.

The New Wave in Utility Automation

Today, we're at the starting point of a new evolution in utility automation – one that's driven not so much by new technologies, as in previous years, but by the ability to more fully leverage the information that's already been created and is stored in the data archives maintained by every utility. The new generation is not focused on what's taking place on the distribution network, but rather on better leveraging data – one of our most abundant yet most under-utilized resources - to reveal why specific events happen. It is focused, in general, on transforming data into knowledge that can then be analyzed to bring about positive business results. And in an era where costs can only be cut so far, finding new ways to achieve bottom line results is critical.

For many years, utilities have been archiving the operational (real-time) and non-operational (historic) information captured by the systems they've installed to automate numerous processes – SCADA, substation automation (SA), outage management (OMS), customer information (CIS), work management (WMS), mobile workforce management (MWM), enterprise resource planning (ERP) and geographic information systems (GIS) used to manage the distribution network.

Today's thought leadership shift is to focus on how this archived operational and non-operational data can be combined with emerging analytic functionality to meet a host of business needs, for example, to more readily identify parts of the network that are at the greatest risk of potential failure. If integrated properly, heads-up information stored by these systems can also aid utilities in proactive replacement or reinforcement of weak links, thus reducing the probability of unplanned events. And this is just the tip of the iceberg when it comes to ways in which data can be transformed into knowledge that fosters business success.

The Data Mart

A recent study conducted by IBM showed that today, the typical company utilizes only 2% to 4% of the data collected in operational systems. Data marts are one way to more fully leverage and use data to produce measurable improvements in business performance.

A data mart, as defined in this article, is a repository of the measurement and event data recorded by automated systems. This data might be stored in an enterprise-wide database, data warehouse or specialized database. In practice, the terms data mart and data warehouse are sometimes used interchangeably; however, a data mart tends to start from the analysis of user needs, while a data warehouse starts from an analysis of what data already exists and how it can be collected in such a way that it can be used later. The emphasis of a data mart is on meeting the specific demands of a particular group of users in terms of analysis, content, presentation and ease-of-use.

Most automated utility systems are installed by the vendor with built-in data marts developed specifically to archive data for that problem domain. For some utilities, this means a decade of logged historical performance data is available for integration and analysis.

More recently, additional benefits and returns-on-investment have been realized through the integration of – and sharing of data among - these systems. Integration has not only minimized redundancy in data creation and maintenance but has also created operational threads that share data and provide all personnel in the organization with access to information critical to the reliability, safety and fitness of the distribution network.

Integration in Practice

Each data mart contains the information relevant to the system that recorded it, for example:

- SCADA contains operational data and non-operational data from all the field devices connected to the SCADA system.
- The substation automation system contains operational data for SCADA and the data warehouse, as well as valuable non-operational information from all substation devices for the data warehouse, and subsequently for mobile workforce management, maintenance management, and other utility systems.
- The outage system data mart stores historical information on the time, duration and cause of outages, as well as the customers impacted by each outage, actual operating network configurations and switching logs.
- The mobile workforce management data mart archives records of inspection observations and preventative maintenance performed in the field, along with logs on personnel productivity.
- Work management system data marts maintain a history of work orders pertaining to facility maintenance and installation, as well as information on construction crew productivity.
- The customer information system maintains billing and load data and tracks trouble calls made by customers, along with the recorded levels of customer service response.
- Enterprise resource planning systems record the financial investment in each component and its current book value.

Today, many utilities routinely mine individual data marts created by these individual systems for purposes like analyzing historical work order logs to identify transformers needing refurbishment or replacement and reviewing ERP archives to determine revenue generated from individual infrastructure components. Much greater value will be derived, however, from the ability to integrate these rich information resources. The next step is to analyze these data marts as cohesive units, a logical consideration since these automated systems work together within the context of utility operations. However, the stumbling block to analyzing these data sets in an integrated fashion has been the lack of a practical methodology or a product designed to handle disparate data sources.

Benefiting from Data Mart Integration

Through the integration and analysis of archived operational data and non-operational data, utilities can provide their personnel, specifically the engineering staff, with valuable system performance and reliability information that can result in more productive use of assets. This information will enable the utility to better understand where to focus future investments in the replacement, maintenance and upgrading of facilities.

Data mart integration will also provide maintenance operations personnel with more accurate details of how each sub-system and component performed under actual operating conditions, especially during peak loads. Based on this information, they can better prioritize which assets need attention and where scheduled work can be deferred on equipment that is performing above specifications.

In another example of the benefits of data mart integration, planning engineers can leverage performance and reliability information on switching and conductor materials to analyze the impact of scaling material quality up or down. With real data available to them, planners will have a more accurate and cost-effective view of what quality materials should be used in a specific installation, saving money by not over-building the equipment.

Integration in Practice

KEMA is currently assisting the Los Angeles Department of Water and Power (LADWP) with the integration of key information and control systems for over 20 user groups, including substation operators, control center operations, transmission and distribution engineering and planning. This energy control system upgrade project requires an assessment of the information requirements across LADWP for the SCADA and substation automation systems, as well as strategic planning for implementation of a new information management infrastructure.

The information will flow from power system monitoring equipment through IEDs over a new fiber-optic wide-area network (WAN) and into a real-time data mart. This centralized storage will provide secure access to analog and status readings (operational data), as well as fault event logs and oscillography (non-operational data). The readings will be synchronized using GPS clocks to provide "sequence of events" capabilities necessary to determine the exact causes of complex outages.

Several technologies will be evaluated to determine the final architecture. OSIsoft™ PI has become a leader in the management of real-time plant information, and will likely play a vital role in data acquisition from various sources, as well as provide efficient storage of the flood of analog and digital readings. Additional OLAP (on-line analytical processing) tools may be used to tie enterprise information together

into a comprehensive data warehouse. One of the goals of the first phase is to ensure that a solid foundation is built, upon which additional capabilities can later be added.

Executives, management, analysts and operations personnel will all have access to the data using linked spreadsheets, an intranet web portal and customized screens organized to display the data in the format best suited to support specific job tasks. Users will have the ability to get up-to-the minute readings, find peaks over various time periods, display alarm and status indicators, and view historical trends over any desired timeframe.

Jack Waizenegger, the LADWP electrical engineer managing the project, explains that one of the goals of the energy control system upgrade project is to enable easy access to valuable power system information by building an electronic bridge from the control system to the enterprise network. Previously the energy control system, the legacy SCADA and RTU system, and each system protection relay was its own island. The same was true for every meter, voltage regulator and so on. Waizenegger says, "Replacing current manual efforts to collect and process data with an integrated information network between systems and user groups will increase efficiency, reduce costs and provide excellent decision support tools."

The LADWP looks forward to harnessing the benefits of the upgrade project. "We've penciled out tangible savings by improving the efficiencies of both our machine and human processes," says Waizenegger. "We can also see possible decreases in the duration of unplanned outages. And our customers will be direct beneficiaries of these time and money savings."

The LADWP example is just one of many ways that utilities can benefit by integrating data marts into a "one-stop shop" repository for the retrieval of information that's critical to both strategic and tactical operating decisions. The integrated data mart concept will soon be regarded as essential tools in the business environment of the modern utility.

GIS as an Integration Tool

Another approach for integrating data marts is through a tool that many utilities already have in place – the GIS. If the GIS and the automated components of other systems already exist, utilities can integrate data from the OMS, WMS, MWM, CIS, ERP, SA Systems and SCADA with GIS, which in turn, will feed integrated data to an engineering analysis tool.

Why the GIS? A GIS is, in effect, a "live" map of the distribution network and its individual components. It links infrastructure assets to a land base with a real-world coordinate system. The architecture of the GIS is ideally suited for integration of data marts because it was designed to accept input from different data sources and relate them to each other for thematic analysis.

Leveraging the GIS, users can pinpoint where events occurred, or are projected to occur, within the network model and then view and analyze the facilities relative to this time and place of the event. By using the GIS to overlay associated data points, engineers can more readily see how multiple smaller events escalate to a major event like an outage. Incidents that once seemed unrelated can thus be viewed from a new perspective, revealing trends that might not otherwise have been detected.

Once data from the various data marts have been integrated and georeferenced, the GIS can feed a composite view of this data to an off-the-shelf engineering analysis and modeling tool designed to measure system performance and predict infrastructure reliability.

Conclusion

There are several approaches for implementing an integrated approach to data marts, but theses approaches all have one thing in common. When implemented correctly, integrated data marts - and the ability to analyze these data marts as cohesive units in an integrated fashion - have the power to put information about the distribution system – and customers – onto the desktops of every department in the enterprise for analysis. And when accurate, timely information is available to personnel at all levels, everyone starts making better decisions - and that benefits the entire organization, along with the customers it serves. ■

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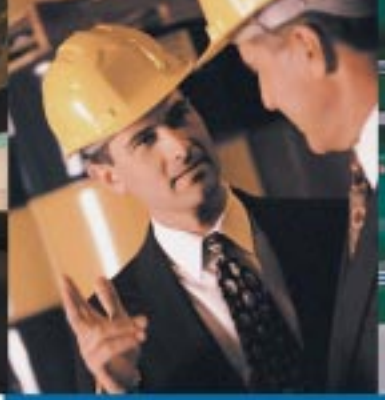

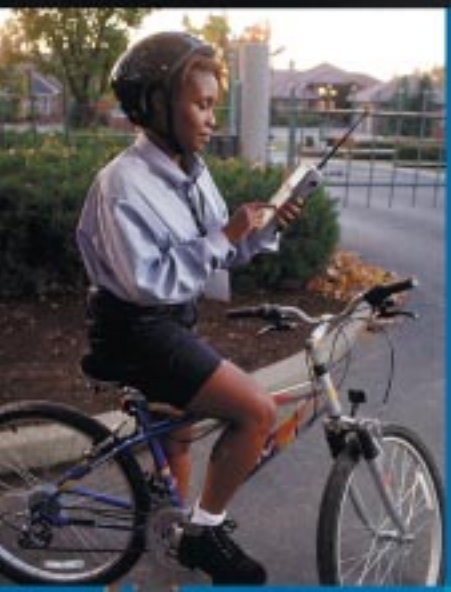

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Total Customer Service:
A Continuing Imperative for the Utility Enterprise

By: Ethan L. Cohen, Director, Utility and Energy Technology Practice, UtiliPoint International, Inc.

The utility industry has been on a roller coaster ride for much of the past few years. Caught in the midst of fitfully starting and stopping deregulation, aging infrastructure, higher than ever demand, and the need to cut costs, increase operational efficiency, and return value and dividends; the utility enterprise must continue to focus on delivering the highest quality of service and care to its customers. The utility customer service imperative is simple and straightforward. Utilities must provide reliable, affordable electric power, natural gas, and/or water to customers while also communicating, billing, and collecting payment from customers in a courteous, efficient, and proactive manner. Although this customer service imperative is simply stated, in the world of utility operations this easy to state mission entails complex business processes and creates multiple challenges for utility management, staff, and information technology (IT) systems.

For many years, energy and utility companies have been devising new information technology strategies and spending millions on computer systems, software, and business design to streamline operations, drive down internal costs, and create new revenue opportunities. While there are many success stories and many more lessons learned from across the industry, the majority of utilities are still not fully customer service focused organizations – despite their best efforts to improve customer service, many utilities still see it as a business function rather than a core business process. Truth be told, the utility industry still needs to understand that customer information and customer care are among the most important functions of the utility enterprise and that customer information systems (CIS) and customer care (often called Customer Relationship Management or "CRM") really do have bearing on every aspect of utility operations and utility planning and decision making.

Over the past decade, utilities have invested substantial resources in CIS, CRM, and other customer care systems and architecture. However, the utility industry is only now beginning to realize that effective and efficient customer service rests not only on hardware but on selection and deployment of customer care applications (software) and customer service optimized business processes. This same hardware- or systems-centric mode of investment has created an environment in which many utilities possess a critical mass of customer care technology, yet they are not realizing the level of cost savings, efficiency, or customer satisfaction expected after making investments in CIS and customer care infrastructure. This has led some utilities to the erroneous conclusion that customer information and customer care systems are not worth the large investment, and therefore, should not remain a high priority in the enterprise. On the contrary, all indications are that customer service and customer care must be the top priority in the utility enterprise.

The Heart of the Matter

Notwithstanding cross-industry comparisons, and the kind of "back-to-basics" approach utilities across North America are now embracing, many utilities, - especially small to medium investor-owned utilities - municipal and public utilities, and cooperative utilities are still struggling to really leverage CIS, CRM, and customer care systems and technologies to their full potential. Caught up in the need to upgrade transmission and distribution infrastructure, increase service reliability, and the ongoing need to serve customers with reliable electric power, natural gas, or water before serving the "softer" needs of customers, many utilities are failing to approach the service question holistically. That is, they are not yet seeing the delivery of power, water, and gas along with the pertinent information about these services (e.g., usage volume and consumption rate data; billing, credit & collections; etc.) as a dominant utility business challenge and/or responsibility.

The proof of this rests in fact. Only a handful of industry leaders, particularly those at small- to medium- sized investor-owned utilities and municipal utilities, surveyed in the past year said that the technologies they use to manage customer relationships are integrated with one another and with the rest of the enterprise. Even fewer indicated that they are very close to achieving goals of making better use of customer care and information systems and customer records. This is not to say that utilities are not making progress; the issue is rather that the majority of utilities still fall short of the goal of having customer-care applications that integrate sales, service, billing and collections and provide customer service organizations with a single extensible view of customer data. This spotty integration prevents the utility from delivering what customers really want and expect; "The full resources of the utility in addressing customer |service calls and requests."

The good news, however, is that customer care research consistently shows that utility managers are increasingly turning to IT departments and information technology solutions to aid in addressing the "total customer service issue." In fact, the vast majority of utility executives surveyed in the latter part of 2003 and early 2004 said that their companies are making customer care and customer management a higher priority for IT departments and for the entire utility enterprise.

A recent survey of more than 500 utilities (jointly sponsored by UtiliPoint International and InfoNetrix) identified more than $119 million in Billing, CIS, CRM, Call Center and related Utility Customer Care Solutions (UCCS) project opportunities, summarized in Table 1, below. Of this total, a substantial majority of the expenditures will

Table 1: Summary of UCCS Survey Results (Q4-2003 & Q1-2004)

Project Type	Total No. of Projects	Total Value (US$000s)
CIS/CRM	59	$84,325
Call Centers	30	$4,215
Bill Print	19	$7,436
Consulting	11	$2,005

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be by municipal and investor-owned utilities. Moreover, spending on customer service and customer care is expected to grow even more robust throughout 2004 and beyond.

Addressing the Challenge

In addressing this continuing customer service imperative, utilities have essentially three choices to consider with regard to their information technology and business process needs. That is, utilities can: 1) choose to in-source solutions, creating their own proprietary systems and software; 2) purchase or license systems and software; or 3) outsource the entirety of systems, software and business processes.

Today, more than ever, utilities - especially municipal and rural electric cooperative (REC) utilities – are increasingly looking to third-party providers for assistance with customer service and customer care business processes and functions. Recent research also shows that utilities are regularly outsourcing billing, collections, and call overflow, and many are outsourcing even more of the "core" customer information, customer service, and customer care systems business processes. Indeed, another recent survey estimated that some 30% of utility companies outsource at least some portion of their customer care operations.

While it is obvious that there are real business risks to outsourcing customer service and customer care, within the larger outsourcing trend there are a number of areas where outsourcing and third-party services can work very well. Again, recent research conducted with over 250 utilities shows that utility outsourcing of several activities (Table 2, following) provides excellent traction for IT service providers. These are also areas where utilities are finding many positive reasons for outsourcing. More specifically, outsourcing of these IT functions and business processes are yielding time and cost savings in training and personnel development, as well as in system development and testing, mitigation of technology risk, and providing vastly better implementation of competitive industry customer service best practices.

Outsourcing isn't the only option, however, and while it is clear that more and more utilities will outsource business functions and processes, the number and quality of hardware, software, and technology solutions vendors licensing and installing technology is also increasing favorably. Although the market for CIS, CRM, and customer care solutions remains very competitive, there is a good deal of business available to suppliers of these solutions.

Embracing the Holistic View of Customer Service

For most utilities, addressing the multifarious challenges of providing "total customer service" will likely mean creating a portfolio of solutions that include in-sourced, licensed, and out-sourced solutions and business processes. Many utility managers have gotten so involved in feature issues and functionality requirements for technology solutions that they have lost sight of the critical business needs and business drivers that compel them to improve customer service to begin with. It is simply not enough to improve customer service, rather it is an imperative that utilities must recognize in response to customer, market, and industry needs.

By itself, technology has little capacity to create business efficiency or true competitive market advantages. Yet, technology remains an essential tool for raising the competitive bar as well as for creating better business processes, capturing efficiency, raising productivity, and reducing costs. When building customer relationships, utilities and energy firms must distinguish between technology's usefulness and its limitations to extract the greatest value from technology.

Utility executives are sometimes confused by the hyperbole that often accompanies technology, especially on the leading edge of new developments. However, customer service and care excellence isn't really measured by what is possible technologically, but rather by customer wants, needs and expectations in the context of the customer-utility relationship. Even given the significant advances of today's technology and utility markets, many utilities still do not fully understand customer needs and desires when it comes to service, information sharing, communications, and dispute resolution.

Because a large portion of customer relationship management — both the business process and the technology — involves capturing customer information and what the utility does with that information once it is captured, utilities often miss the fundamental purpose of collecting information to begin with; that is, communication. Obviously utilities should use the information they collect to communicate with customers, but there is a common dilemma regarding which information should be going to which customers and when. The fact is, many utilities really don't know (or aren't sure), especially when it comes to providing outage information. Deciding what information to communicate and how often is a formidable challenge in light of the recent Do-Not-Call legislation. Nonetheless, outbound communications is a vital part of a best-practices customer relationship strategy.

Research suggests that the answer to these questions is to let customers tell you what information they want and how they want it by allowing them to opt-in. In other words, customers must have a way to tell the utility what information they want to receive and when (and how) they want to receive it. In addition, research consistently shows that payment alerts, outage notifications, order status updates and news about new products or services in which customers have expressed an interest are welcome in utility-to-customer communications.

Utilities have not conventionally emphasized outbound communication — in part because they have erroneously mandated that the costs of customer communication be tied to revenue generation (i.e. collection, dispute resolution, etc.). Additionally, utilities have traditionally viewed customer communication as being event specific or demand driven, rather than a resource to manage the customer relationship throughout the entire customer lifecycle. Utilities are now realizing that in addition to improved customer service and customer care, outbound customer communications can dramatically help utilities avoid the future high costs of customer contact and customer service. Outbound customer service and communication applications that are already yielding benefits to utilities include:

- Welcome Calls
- Electronic Funds Transfer (EFT) confirmations
- Account Activation and Deactivation services
- Payment Reminders & Overdue Notices
- Rate Change Notifications & Tariff Notices
- Crew Mobilization Notices
- Outage/Restoration Notification
- Customer Satisfaction Surveys

Table 2: Potential Areas for Business Process Outsourcing (BPO)

➢ Credit and Collections	➢ Data Center Management
➢ Bill Printing	➢ Application Management
➢ Help Desk	➢ Desktop Computer Support
➢ CIS/CRM	➢ Call Center
➢ Bill Remittance	➢ Call Overflow Management
➢ Online Bill Presentment & Payment	

Again, the goal of the utility should be to manage customer expectations, provide customer services and communicate with each customer throughout the entire customer lifecycle.

Getting Back to Basics

As the electric utility industry retrenches and focuses on its core business of delivering reliable electric power to customers, utilities must resist the temptation to stop investing in state-of-the-art information technology and customer service and customer care solutions. If anything, utilities must work even harder than ever to bring CIS, CRM and other dimensions of customer care into balance with infrastructure needs and investments. Even though the "Getting back to basics ethos" resonates in today's economic and energy business environment, utilities should only be turning back the clock to the extent that they are redoubling their commitment to providing excellent service, maintaining community focus, and delivering reliable power to customers. Rather than going back in time, utilities will have to go "Back to the future," and continue to invest in both infrastructure AND technology in order to meet the new challenges they face.

A guide to where utilities should make these important investments can be found in remembering what customer total customer service means. Utility customers want:

- Access to the utility and to customer service*
- Accurate, timely billing and dispute resolution
- Communication about service outages, interruptions, etc.
- Communication and transparency about tariffs and tariff choices
- Easy access to information about both cost and energy conservation

*(*In today's world, this means that customers must be able to contact the utility by phone, fax, email and in person.)*

A fringe benefit derived from a renewed customer focus is the good relationship and cooperation with regulators, investors, and shareholders. Regulators should be pleased to see that both the regulated and deregulated entities in the business are providing a high quality of service for a fair price. Shareholders, in their desire for solid company performance, should be the main beneficiaries of diligent deployment and use of information technology; reductions in direct costs and overhead; and better allocation of resources.

At the end of the day it is clear that refining business objectives through the mind's eye of the customer will help utility executives prioritize decision making and yield valuable insights, both in terms of high-level utility strategy, as well as at more basic levels in the technology selection process. Total customer service has been, was, and is still the imperative in the utility industry. Some of the primary issues and trends driving – or being driven by – this utility customer care imperative are summarized in Table 3, following.

About the Author

Ethan L. Cohen, is Director, Utility and Energy Technology for Practice UtiliPoint International, Inc. Prior to joining UtiliPoint, Mr. Cohen was a manager at Blue Ridge Partners, an energy and utilities business process outsourcing consultant. Mr. Cohen also has experience as Research Director Energy and Communications at Aberdeen Group, a leading information technology market research and consulting firm and as Senior Analyst with The Yankee Group, where he built the first energy technology focused market research and advisory practice. Mr. Cohen also worked for a period in the United States Senate as a legislative staff member, where honed his energy industry regulatory expertise. Mr. Cohen is quoted frequently in energy and utility industry trade journals and in the business media. He holds an A.B. with subject honors from Vassar College and an M.A. from Brandeis University.

UtiliPoint International, Inc. is a leader in providing consulting services to the energy industry, and has a 71-year history and over 50 utility clients worldwide. UtiliPoint International's staff is comprised of leading energy experts with diverse backgrounds in utility generation, transmission & distribution, retail markets, mergers and acquisitions, emerging technologies, investment capital, information technology, renewable energy, regulatory affairs, and international issues. ■

Table 3: Utility Customer Care Issues and Trends

- Customer care environments remain cautious in their technology and process evolution
- The trend toward COTS product CIS replacements is ramping up
- Contact center evaluation driven by cost reduction and agent optimization objectives
- Better alignment of contact centers with major utility strategic cost initiatives
- Customer imperatives still fuel customer care innovation. Specific drivers include:
  - ⇨ Proactive customer care initiatives
  - ⇨ More frequent customer interactions
  - ⇨ Improved service to customers while simultaneously driving down costs

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SCHEDULE OF EVENTS

SUNDAY, JUNE 6, 2004

7:30 a.m. – 12:30 p.m.	Convention Golf Tournament
12:00 p.m. – 6:00 p.m.	Registration
4:30 p.m. – 6:30 p.m.	Welcome Reception/Exhibit Hall
6:30 p.m. – 8:30 p.m.	"Power by Association" Dinner
6:30 p.m. – on	Open for Supplier Events

MONDAY, JUNE 7, 2004

7:00 a.m. – 2:00 p.m.	Registration
7:30 a.m. – 8:30 a.m.	Continental Breakfast/Exhibit Hall
8:30 a.m. – 10:30 a.m.	Opening General Session
10:30 a.m. – 1:00 p.m.	Expo Open
11:30 a.m. – 1:00 p.m.	Lunch/Exhibit Hall
1:00 p.m. – 2:00 p.m.	Critical Issue Discussions
2:00 p.m. – 5:00 p.m.	Open for Association Business Meetings
7:00 p.m. – 10:00 p.m.	Grand Event – Universal Studios Florida

TUESDAY, JUNE 8, 2004

8:30 a.m. – 2:30 p.m.	Registration
8:30 a.m. – 9:00 a.m.	Networking Refreshment Break
9:00 a.m. – 10:00 a.m.	Critical Issue Discussions
9:30 a.m. – 2:00 p.m.	Spouse/Guest Program
10:00 a.m. – 12:30 p.m.	Expo Open
11:00 a.m. – 12:30 p.m.	Lunch/Exhibit Hall
12:30 p.m. – 2:00 p.m.	Second General Session
2:00 p.m. – 5:00 p.m.	Open for Association Business Meetings
p.m.	Open for Supplier Events

WEDNESDAY, JUNE 9, 2004

7:30 a.m. – 9:30 a.m.	EEI Board of Directors Meeting
7:30 a.m. – 11:30 a.m.	Registration
8:30 a.m. – 9:30 a.m.	Continental Breakfast
9:30 a.m. – 11:30 a.m.	Closing General Session

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Enhanced Customer Care Systems:

Pathways to Greener Utilities

By: Guerry Waters, CTO & Sr. Vice President Marketing & Product Strategy, SPL WorldGroup

Customers are concerned about the environment.

That's a message utilities have heard loud and clear. As a result, they're working to ensure that customers understand the tough choices utilities face on environmental issues. At the same time, they're directly addressing the negative impact that energy use has on the environment—putting more sophisticated controls onto smokestacks, using cleaner fuels, and promoting demand-side management programs that ensure that customers get the most value from the electricity they pay for.

Increasingly, customer service and billing departments are being asked to shoulder some of the environmental burden utilities bear. They're eager to accept this new responsibility. But they're able to do so only when their infrastructure—the customer care and billing system that lies at the heart of their operation—is able to accommodate new programs, new products, and new ways of doing business.

Here are three areas in which you'll want to ensure that your customer information system, your call center, and the entire customer service and billing staffs are ready and able to contribute to the "greening" of tomorrow's utility.

Demand Response Programs

Demand response programs are blackout-avoidance initiatives in which a wide variety of commercial and industrial customers can participate. Utilities initiate demand response programs in times of crisis—when demand rises precipitously on a very hot summer day or when an accident takes down part of the grid and forces excessive load onto the remaining lines.

In the past, utilities used interruptible rates to attack these crises. Large industrial customers got a special rate—easy for a CIS to handle—if they agreed to unexpected, utility-initiated reductions or service terminations.

Interruptible rates still work well for many utilities. But the rise in the electricity demand curve and environmental pressures against grid expansion are administering a one-two punch in some areas. Increasingly, utilities must find alternatives that expand their load-reduction ability.

Demand response programs are not the sole answer to load and congestion problems, but they can be a valuable part of the equation. In demand response, utilities ask facilities to reduce load during specific periods. They reward those that respond with financial incentives geared to the length and size of the reductions.

Billing Implications of Demand Response

The billing system is the primary vehicle for measuring participation in demand response programs and for distributing the rewards.

The primary tool is the ability to undertake complex billing (also known as "real-time," "interval," or "time-series" billing). Complex-billed customers install special meters to measure consumption during prescribed intervals. The utility then processes the time-series information according to its contract with the customer; mapping it, for example, to prescribed time-of-use periods.

In its routine use, complex billing helps customers save money and helps utilities predict and manage load. During periods of crisis, the fact that consumption can be measured during brief 10- or 15-minute intervals means that a wide variety of companies can sign up to curtail load by specific amounts during specific periods. No longer is the high-tech industrial confronted with the "interruptible" threat of losing power—and tens of thousands of dollars—in the middle of key processes. Instead, the facilities manager can sign up for a curtailment that begins after the process is completed.

Types of Demand Response Programs

Under reliability-based demand response agreements, customers agree to potential participation in the event of a threatened overload. If a problem arises, utilities request demand reductions and subsequently reward actual decreases in usage. Price-based programs use a different trigger – the wholesale price of electricity. Customers determine in advance a set price at which they will reduce demand.

There are dozens of variations on these two basic programs types, including guarantees on length of cutback and variations in response times and methods. Some programs even incorporate penalties for failure to reduce demand.

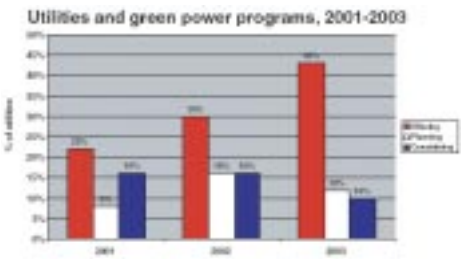
Similarly, the manager of an office complex can enjoy the financial rewards of turning down the air conditioning for several hours without risking an "interruptible" power loss that would bring down the computers and strand people in elevators.

Green Power Programs

The option to use "green" electricity – power generated from renewable resources such as wind, sunlight, or biomass fuel – is increasingly. As a result, regulators are permitting, and in some cases requiring, utilities to offer green power options.

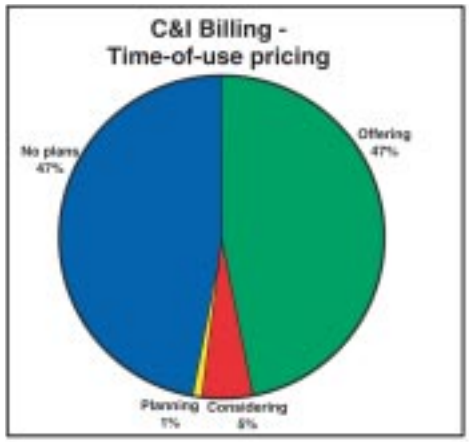
Many utilities are able to respond only minimally to the challenge of offering green power. Their billing systems limit them to requesting "charitable donations" from customers—not usually a type of program that attracts large numbers of participants.

Programs are more successful when they offer multiple choices—not just optional amounts of green energy but also choices among types of renewables used for generation. That's because there's a lack of consensus among environmentally sophisticated consumers as to the desirability of various types of renewable energy sources. One person's "green" may well be another person's "brown." One utility in Nebraska, for example, found that its customers preferred wind and biomass, understandable preferences in an agricultural Great Plains state. Customers in the Southwest may lean toward solar projects. Hydroelectric power, once celebrated for its lack of emissions, has fallen into disfavor among some groups because of impacts on stream flows and fish populations. Wind farms are seen as beautiful by some, while others object to the "visual pollution" and to the hazards turbines pose to birds and bats.



UTILITY GREEN-POWER PROGRAMS ARE CLEARLY ON THE RISE. ABOUT HALF OF ALL NORTH AMERICAN UTILITIES ALREADY OFFER THEM.

Chart from Utility Green Power Programs, Chartwell, Inc., December 2003. Reprinted with permission.



Billing Implications of Green Power

Green power programs rarely impose billing requirements as complex as do demand response programs. But, taken in total, their added strain on existing billing systems can be significant. Utilities must be able to combine green power products with their full slate of other offerings across large and diverse markets. Some residential green power users will also be eligible for discounts offered to elderly, disabled or low-income customers. Small business customers may want to combine green power products with other pricing programs, like time-of-use plans.

Such pricing and billing demands will grow more complex as more consumers install renewable-energy generating facilities on roofs and in back yards. Some states already require utilities to permit these home-based generating facilities to feed energy into the grid and to reimburse customers for that energy, either through direct payment or by subtracting the energy fed into the grid from the energy pulled from it during higher-demand periods. This "net metering" could well be extended to generation from fuel cells, which may become relatively common as the technology advances, as prices decrease, and as fears or terrorism drive more customers toward some degree of electrical self-sufficiency.

Clearly, these emerging developments require greatly enhanced billing capabilities. Systems must be able to handle multiple products and services. They must be able to accommodate rapid change as customers revise their green-power preferences and as they install new technologies.

And tomorrow's requirements are likely to be even greater as billing systems must link with increasingly "smart" applications that increase efficiency but that also require two-way flows of information between the home and the utility.

Making Demand Response Work

Demand response programs need more than just complex-billing software to work.

Customer service departments may be called on to provide workshops and materials that educate customers about the advantages of complex billing and the variety of contract terms available.

Customer-care solutions that help develop and manage contracts can be very helpful. Customers with on-site generation, for instance, need different terms from those required by customers without such facilities. A customer that must halt a production line faces very different constraints from one that only needs to turn the air conditioning down. Customers will need guidance to understand these issues and arrive at demand-response agreements that are workable in their particular circumstances.

Utilities can also encourage participation in demand response programs by positioning participation within a package of wider cost-savings. Interval data can

- Pinpoint operational procedures that create expensive peaks (say, turning on all a facility's equipment at one time).
- Reveal equipment problems, allowing customers to perform maintenance or repairs that reduce consumption and prevent downtime.
- Help customers identify billing errors (one facility or line cross-wired with another).
- Make a facility eligible for more favorable supply contracts.
- Allow customers to monitor individual production lines, facilities or operations separately. Businesses can therefore pilot test reduction strategies on individual lines and measure the results accurately. If a strategy produces significant results in one situation, the customer can extend it to additional units, individually monitoring each new case to insure that the remedy is effective in the new setting. The ability to document results across diverse settings is one reason that demand management products are gaining rapid acceptance across most C&I market sectors.

Ways to Offer Green Power

Utilities tend to offer green power via three different billing strategies.

Contribution programs offer customers the chance to contribute a monthly amount over and above the price of the energy they use. Contributions are then pooled to fund development of renewable energy facilities within the community. These programs are simple to bill and administer and account for about 20 percent of the current green power market, according to the U. S. Department of Energy's National Renewable Energy Laboratory (NREL).

Energy-based programs allow customers to purchase discrete amounts of energy, commonly in 100 kWh blocks, to be generated from renewable resources. The utility either generates or purchases this amount of green power. NREL figures indicate that energy-based programs currently account for roughly three-quarters of the green power marketplace.

Capacity-based programs offer customers fixed blocks of electrical capacity for a monthly fee, commonly from about $3.00 to $6.60 per 100 watts of capacity. According to NREL, these programs account for only about 4 percent of current green power revenues.

Enhancing Efficiency Through Information

Today's sophisticated billing systems can provide information that customers will find very useful in reducing their energy use.

Large customers, for instance, may use daily consumption breakdowns, normalized for weather conditions, to identify and eliminate power-consumption anomalies. Retail chains may use consolidated bills to compare consumption at similar outlets and identify efficiency "best practices."

Providing more information to consumers will likely, of course, stimulate customers to pose increasingly complex questions to customer service representatives. But that doesn't have to mean increases in call-center costs. The right billing and customer care system can speed the CSR to the detail behind a customer's bill entry. Scripts and business process assistants can provide prompts that guide a conversation to a speedy and satisfactory conclusion.

Scripts and assistant tools will become increasingly essential as utilities provide customers with new services and energy-saving products. CSRs will require interactive diagnostic applications that accept input from the customer and provide solutions to problems like appliance failure, faulty circuits, and power fluctuations. (If this software incorporates marketing functionality to cross sell appropriate products, so much the better.)

Collateral Environmental Benefits

The billing process itself has a small but significant negative effect on the environment. In the aggregate, utilities use huge amounts of paper and ink to print paper bills, and the fuel required for bill and payment delivery is not inconsiderable. Billing systems that support electronic bill presentation and payment reduce this consumption.

Similarly, billing systems that provide wireless transmission of orders to field service personnel can drive down paper consumption. And an electronic interface between customer care and work management systems ensures efficient deployment of staff to the locations needed.

The Color of Money

Long before "green" came to mean "environmentally benign" it had another meaning. In American slang, "green" and "greenback" still indicate money.

Those meanings can coexist comfortably in today's utility, which can readily "do well by doing good." Reducing the need for new generating facilities and new transmission and distribution lines helps the environment while also cutting utility costs. The demand for increased efficiency means that utilities can offer new consulting services and energy-saving products that save money for customers, reduce the environmental demands of energy generation, and provide profit opportunities for utilities as well.

Enhanced customer care and billing systems represent one of the principal tools that providers can leverage to create and deliver added value in the demanding energy markets of the future. Enhanced customer care systems won't by themselves sell demand management and alternative power products to millions of new customers. But they are essential to ensuring that the costs to provide these new services are low and that long-term customer satisfaction is high. ■

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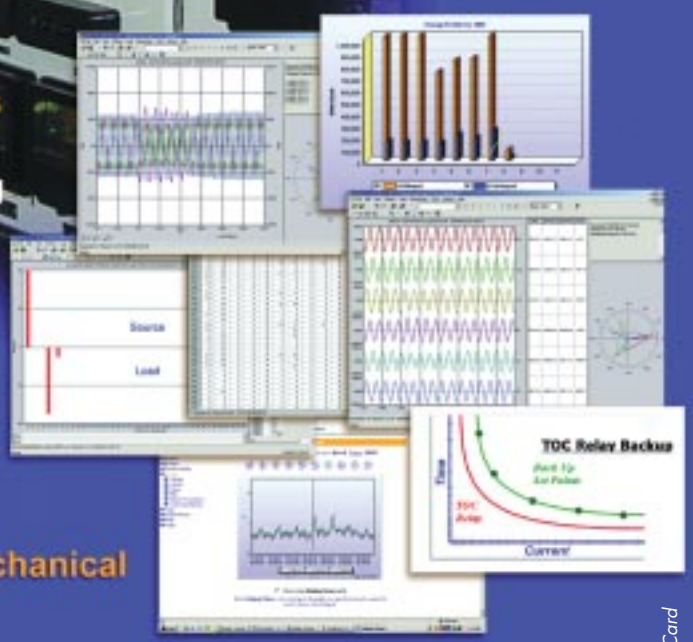

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The Evolution of Information Technology in the Utilities Industry

New Software Solutions Open New Market Opportunities

By: Jim Menton, Industry Principal, SAP for Utilities

Traditionally, utilities have had little experience with competition or strategies for winning new customers. Consolidation and globalization have changed that, as the industry transforms into a more dynamic market-driven environment with fewer, larger companies.

Deregulation has opened up new opportunities and new threats, forcing utilities to expand their focus from simply providing energy, to rethink their strategies and align them more closely with customer needs. Utility providers are therefore renewing activity directed at improvements in operations, use of information technology and automation of business processes. Additionally, more cross-functional business processes and customer service-focused solutions are being introduced to improve operational efficiency and maintain and expand the customer base.

As customers and business partners increasingly demand greater empowerment, utilities companies seek to improve interactions and relationships in their entire business ecosystems by enhancing software capabilities for collaboration, gaining deeper customer and market insight and improving process management.

The Impact of Deregulation

Although a global phenomenon, the pace and extent of deregulation varies widely across regions and across industries, especially the power and natural gas markets here in the United States. The reasons for such diversity lies in the infrastructure of the supply gird, ownership behavior in the energy industry, currently applicable law and the structure of the population served.

Nevertheless, three key drivers for deregulation are common throughout the world. First, globalization has led to more open markets, enabling companies to enter new markets more easily, but also exposing them to greater competition. Secondly, privatization in some countries has also resulted in the generation of fresh capital, allowing further investments in infrastructure and innovative technology. Lastly, market restructuring has led to more customer choice, competitive pricing and new customer structures, driving utilities to conquer multiple parts of the value chain as best-in-class providers.

One of the major consequences of deregulation is the unbundling of utilities, which in the first instance has split the roles of the energy supplier (RetailCo), the distribution company (DisCo) which operates the grid, the metering operator (MeterOp) and other related players. This means that commercial and industrial customers can purchase energy and related services from multiple vendors.

In the second phase, incumbents are rethinking their strategic focus on unbundled retail activities, choosing to perform one or more of the new energy values chain roles, depending on perceived core competencies, risk appetite and preferred market focus. The depth of specialist competencies needed to met customer expectations and compete successfully requires incumbents to reinvent themselves—for some an evolutionary process; for many, a revolutionary turnabout.

Customer Management Trends in the Utilities Industry

Customer information systems (CIS) for utilities have been around in some form or another for more than 20 years. In the late 1990s, when utilities first began to embrace new software innovations to help manage their customer relations, the market comprised vendors selling mission-critical enterprise systems focused primarily on operational customer relationship management (CRM) functions such as account maintenance, order processing, product and service management, billing, credit collection and accounts receivables, with some collaborative customer-interaction functionality. In this traditional approach, companies deployed expensive, cumbersome enterprise solutions tied individually to different processes. This approach was marked by numerous interfaces, heavy maintenance requirements and unnecessary data replication or manual data capture, resulting in a high cost of ownership and slow responsiveness to changing markets. As the discrepancy between investments and measurable success became more apparent, the initial euphoria evaporated and utilities became more conservative in their solution appraisals.

Today's companies are now seeking solutions that will help them:

- Optimize process efficiency within front, mid and back office
- Develop strategies for adapting change
- Speed time to market
- Grow revenues and expanding market share
- Reduce service costs
- Improve profit margins and drive shareholder value

The solutions of choice are flexible, scalable, highly integrated and are delivered by a vendor with the industry experience, the technical expertise and the staying power to meet their long-term and short-term needs.

Effective Data and Process Integration

Customers are the cornerstones of business processes transformation in utilities. The changes brought about by deregulation have become most evident in an examination of customer information systems. Deregulation has increased the need for intensive data exchange and better coordination of administration and accounting processes, especially in the sales channel.

As customer management in a utility company is strongly linked to the existing processes and solutions, customer management solutions and technologies must be capable of supporting and maintaining assignments from several company types (DisCo, MeterOp and RetailCo) and from diverse processes such as meter management, meter reading, contract billing, accounting and work management, while also maintaining flexibility and scalability. A prerequisite for this is the ability to integrate data across diverse and complex IT systems, as well as enable immediate, role-based access via multiple communication channels such as desktop, laptop, PDA, phone, e-mail and Internet.

Utilities companies therefore require a customer management system which is strongly linked to processes and solutions along the whole value chain, ensuring real-time collaboration and data integration between the:

- Front Office: call center marketing system (business intelligence, reporting, campaign management, demand-side management, sales force management and bill presentation processes)
- Middle Office: data mining, work flow management, Electronic Data Interchange (EDI), churn management, customer database, contract management, billing, debt management
- Back office: trading and risk management, distribution, partner and supplier management

Advanced Customer Services at FirstEnergy

FirstEnergy Corporation, the fourth largest investor-owned electric system in the United States comprising seven electric utility operating companies, selected an enterprise platform to support its customer service program. The company was seeking a single, fully integrated solution, which would support all activities of its Corporate Service Group as well as core business functions such as supply chain, finance, and human resources. FirstEnergy's Customer Service Group is now managing distribution functions such as call centers, billing, credit, and collections for its 4.3 million customers with a seamless, integrated solution.

FirstEnergy is also currently developing a portal based on business intelligence solutions to aggregate data derived from hundreds of off-the-shelf, homegrown, and legacy applications to give its managers a more complete picture of plant and transmission line performance information to help them make more informed business decisions. As the existing multiple legacy systems and the associated interfaces have been replaced with the integrated solutions, FirstEnergy has been able to significantly lower its IT costs and increase data and process visibility across the entire organization.

City of Tacoma Offers Multiple E-Services to Utilities Customers

Like every other city and government organization, the city of Tacoma continues to face budget cutbacks combined with demand for more services. To address these issues, Tacoma recently implemented a comprehensive solution to support the City's general government departments as well as Tacoma Public Utilities, which provides 183,000 of Tacoma's citizens with electricity, water, storm drainage, residential and commercial solid waste, sanitary sewer, cable and Internet services. In addition to managing the billing service for these accounts, the system calculates the payroll for 5,500 employees and provides a single integrated work management system across all the City's divisions.

The City replaced 100 legacy systems with an enterprise solution, and merged six major databases — including the old Customer Information System, the HR application, Financials, Permitting, and Tax & Licensing. The new end-to-end functionality has enabled the City to also streamline its business processes, reducing individual processes from 650 to only 350 in total. For example, the City used to have three or four different ways to create a purchase order, varying by division; today, they have only one.

The City is also planning to promote customer self-services more consistently. As customers gain direct access to their accounts, they will increasingly be able to do more of the work that customer service representatives did, like pay bills, view account information, and answer their own questions about City services. Customers will also be able to choose their payment due dates, combine bills for multiple properties, and have all metered services appear on one bill. This will help the City of Tacoma achieve significant savings on it customer services, while providing its customers the flexibility and the accessibility they demand today.

Customer Self-Service Systems Open New Business Opportunities

Today's customer is increasingly accustomed to carrying out transactions electronically, from paying bills via the Internet to accessing 24-hour online support and a host of other interactive online services. They therefore expect the same flexibility when communicating with their utilities provider. At the same time, customers are more cost-conscious, seeking greater transparency as to what value they are getting for their money.

Customer self-service is a compelling strategy to increase the speed and effectiveness of after-sales maintenance and repair services. When implemented the right way, such solutions have the potential of yielding significant benefits in the form of reduced service costs and improved productivity. Though industry observers consider a 30 percent deflection of calls to self-service channels as adequate, the rate should and could be closer to 80 percent to maximize the business benefits and cost savings. It is therefore essential that utilities continue to encourage customers to use the self-service channels.

In order to meet the demands of this growing customer segment, utility companies must ensure that systems are in place to deliver highly automated and accurate data transfer, easy navigation, 24x7 availability and convenience.

With effective software solutions in place, utilities can significantly reduce customer service costs, improve customer service, and allow customer service representatives to spend more time pursuing new revenue-generating business opportunities through consulting and telesales.

Advanced Call Center Management at OG&E

Oklahoma Gas and Electric (OG&E), the largest power company in Oklahoma with approximately 720,000 customers, was looking for an advanced and integrated call center solution to handle the daily volume of around 12,000 calls more cost-effectively. In order to raise the number of calls completed in self-service, reduce call handling times and manage volume peaks in-house while saving outsourcing expenses, OG&E selected a speech-based call management solution which would integrate seamlessly with its existing enterprise resource planning environment. Built on top of a telephony infrastructure, the speech-based application has considerably enhanced self-service capabilities, offering an effective and easy-to-use interface for a higher rate of automated call completion. Furthermore, the integration of the telephony framework with the enterprise solution has enabled relevant customer information to be readily available to customer service representatives when the call is received. Customers no longer have to repeat their account number to the customer service representative, which improves both efficiency and the overall user experience.

Today, all customer service calls to OG&E are initially handled by the self-service telephone application, raising the rate of automated customer handling from 5% to 45% of total calls received. Customer services like outage reporting, account balancing, installment plans, payment office location or transfer and routing to other services are also supported by the new solution.

Utility companies are increasingly benefiting from new, advanced technologies which are transforming the dynamics of time-to-market and global distribution, enabling them to:

- Gain market insight by understanding market and customer preferences, behavior, and service needs
- Change their views of customers from rate payers to customers for life
- Gain customer insight by targeting customers with services they want at the prices they demand
- Achieve consistent, multi-channel customer interactions by ensuring that customers' experiences are the same no matter which channel they use
- Attain cost leadership by cutting costs and maximizing regulatory incentives (where applicable)
- Take proactive measures on key market and customer — initiatives to gain a competitive edge.

Utility companies are aggressively implementing new ideas to achieve their operational objectives, and CRM is emerging as the most useful enabler of this transformation. ■

About the Author

In his role as utilities principal for SAP America, Jim Menton is responsible for advising sales, marketing and development staff on marketplace trends to support the company's U.S. utilities initiatives. Jim brings 24 years of hands-on expertise in all aspects of the energy industry, including both supply-side and demand-side expertise, energy management, commodity procurement, utility operations, strategic marketing/sales, consulting and software development. Jim also participates at the national level delivering thought leadership and promoting industry best practices.

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