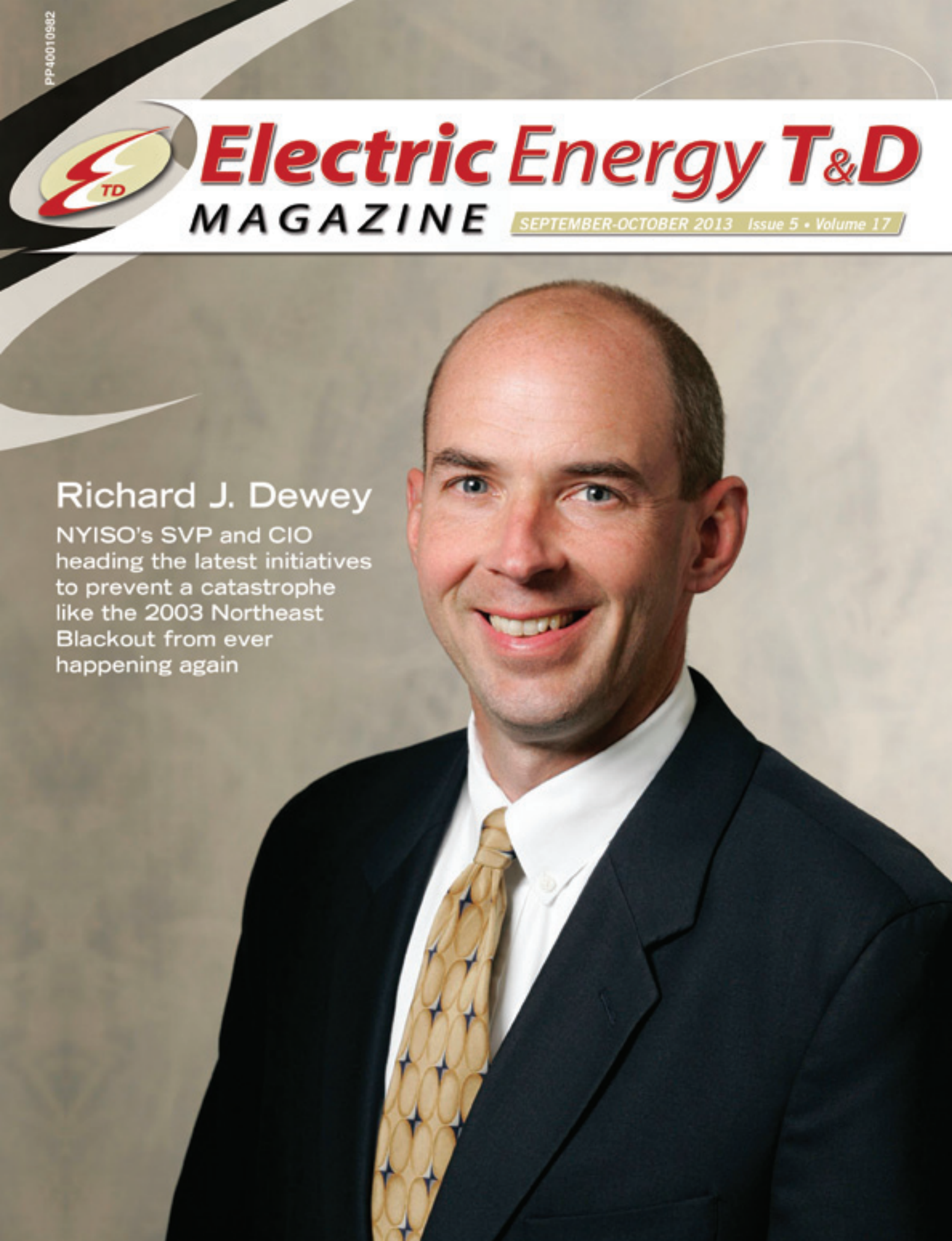
PP40010982

Electric Energy T&D MAGAZINE

SEPTEMBER-OCTOBER 2013 Issue 5 • Volume 17



Richard J. Dewey

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Electric Energy Magazine is published 6 times a year by: Jaguar Media Inc.
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Terrebonne, QC Canada J6W 5S6
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Post Publication mail agreement #40010982
Account #1899244

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TERRY WILDMAN

POWERPOINTS

Bound for Glory?

I'm neither a physicist or a mathematician. I do possess, however, an insatiable curiosity. Ideas surrounding energy in all its forms are a constant source of discovery and fulfilment to me. I often wonder how people like Albert Einstein, Galileo, Marie Curie, and Edward Teller found the heart to carry on with their work in the face of ridicule and abuse by their peers and a skeptical public.

In the late eighteen hundreds, German chemist Wilhelm Ostwald ran head-long into this treatment when he began to promote his theoretical foundation for chemistry, one in keeping with the first and second laws of thermodynamics. The first law maintains that matter and energy can neither be created nor destroyed – only transformed. The second holds that in any such transformation, the capacity of the energy to do useful work is diminished. The energy does not disappear – some has become what is known as 'bound' energy. In 1865, German physicist and mathematician Rudolf Clausius labelled this degraded energy as *entropy*, which allowed the law to be stated categorically: within any thermodynamically closed system energy is conserved but *entropy* must increase.

Although he was not among the pioneers of energetics, Ostwald pushed the limits of these laws in developing a strict understanding of chemical transformation and soon became the central figure in its maturation. He concluded that the science of energy was not merely a subfield within physics but the very basis upon which physics is built. He immediately told physicists in his homeland their discipline needed to undergo a 'radical reorientation' to make room for these fundamental truths. Because matter is indestructible and energy degrades, energy must be the key: "From now on," he claimed, "the whole of physics had to be represented as a theory of energies."[1]

His peers mocked and jeered him. Ploughing through this he immersed himself deeper into the issue. All he saw was 'energy.' If energy cannot be created and cannot be recycled, then the energy allowance of the planet, and of the human economy on the planet, must be finite.

From that point on, Ostwald grew his doctrine of energetics claiming that all human understanding including: natural and earth sciences, history, economics, sociology, politics, and even ethics and moral philosophy. This, according to him, because the laws of thermodynamics implied a new unequivocal imperative: "Waste no energy!"[2] It seems to me that Ostwald must have had a crystal ball.

The imperative spawned many scientists to look more intently at thermodynamic hurdles to the point where many disciplines began to take on different shapes. Not the least of which were the three outstanding problems in the Newtonian physics of the day – the photoelectric effect, Brownian motion, and black-box radiation – the very ideas that led a young Swiss patent clerk to his overthrow of the discipline's mechanistic foundations with his general and special theories of relativity.

According to Daniel C. Foltz, increased interest in ecological and environmental history late in the twentieth century led to sustained inquiries that focused on the energy history of the human economy, such as Alfred Crosby's *Children of the Sun: A History of Humanity's Unappeasable Appetite for Energy in 2006*. Seen through the thermodynamic lens, what has been called the industrial revolution, a once-in-planetary-history drawdown of stored sunlight to do work and make wealth in the present.

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The petroleum era will most likely depart as suddenly as it came; in a grand sweep of geologic time, our use of petroleum is just an instant, a brief burst of frantic activity that has produced exponential growth in wealth and human population – and in humanity's impact on planetary ecosystems.[3]

Energy as a master resource points directly to an appreciation of a vital economic indicator that is more fundamental than the monetary price of energy – net energy uptake. This is the energy available to an economy once the costs of obtaining that energy are paid. In other words, the energy return on energy invested (EROI). A basic example might look like this: to make economic use of a barrel of oil requires not only drilling the well but also transporting the oil to a refinery, converting it to a variety of products, getting those to market, and finally to the end-user. Before drilling can commence considerable costs must be put into play such as research and development, workforce management, drilling apparatus, refinery equipment, tank trucks, cars, etc., etc.

The fly in the ointment is that when EROI is calculated, standard boundaries must be in place to ensure consistency. Analysts are having trouble establishing and agreeing on these parameters as there are so many small details to consider. Thus far, an agreed-upon standard for the EROI boundaries would allow for economically rational decision making between different energy systems. The biggest flaw generally encountered is choices that are made according to current market price, which is man-made, dependent on demand, subsidies, taxes, and rates at which a flow of energy is extracted from its global stock. Policymakers should be trying to maximize total sustainable deliverables thereby maximizing the EROI of a sustainable energy system. The following table shows relative EROIs and provides a good jumping-off point to determine monetary prices of different kinds of energy.

Average and High and Low Estimates for Energy Return on Energy Invested[4] (Different Energy Sources)

Energy Type	Average	High Estimate	Low Estimate
Oil	19:1		5:1
Coal		85:1	50:1
Natural gas	10:1		
Hydroelectric		267:1	11:1
Nuclear		15:1	1.1:1
Wind	18:1		
Solar photovoltaic		10:1	3.7:1
Geothermal electricity		13:1	2:1
Geothermal heat pump		5:1	3:1
U.S. corn ethanol		1.8:1	<1:1
Brazilian sugar cane ethanol		10:1	8:1
Soy biodiesel		3.5:1	1.9:1
Palm oil biodiesel	9:1		
Tar sands oil	5:1		
Oil shale		4:1	1.5:1
Wave	15:1		
Tidal	6:1		

Experts continually warn against disregarding the climate consequences of burning carbon-based fuels noting that, in particular, the EROI of oil will decline further, as drilling increases, shipping to more remote markets becomes more commonplace, and reliance grows on energetically expensive oil from tar sands and shales.

Is there an EROI sweet spot that spells success to an economy and/or civilization? Studies show that an EROI of 3:1 would represent a: "bare minimum for civilization. It would allow only for energy to run transportation or related systems, but would leave little discretionary surplus for all the things we value about civilization: art, medicine, education and so on."[5] The same study indicates that an EROI of 5:1 from the world's main fuels would be required to maintain anything that we would call civilization but would be unable to support military capabilities or any other means of securing an energy and resource-rich future.

One of the real bright spots, however, is renewable energies. These boast an EROI ranging from 10:1 to 50:1. There is a down side – can renewables be built out and exploited expediently enough to avoid having to determine what the minimum EROI might be before civilization falls below it?

At the end of the day, economics will have to recognize that we live on a finite planet and that the laws of thermodynamics apply to economic life as to all other life. British physicist Arthur Eddington observed nearly a hundred years ago that: "The second law that entropy always increases holds, I think, the supreme position among the laws of nature."[6] Had economists been shown in the 1930s or 1970s that their theories opposed the second law, we would have made a great deal more progress toward the goal of establishing our economy and civilization on a sustainable flow of matter-and-energy.

On this very subject, foresters have developed a saying:

> *The very best time to plant a tree, like the best time to admit that energy is the master resource, is decades ago. The second best time is today.*

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[2] Zencey, E. "Energy as Master Resource." Is Sustainability still Possible? (2013): 74
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[6] Eddington, Arthur S. The Nature of the Physical World. New York: MacMillan Company, 1928

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THE PROVEN POWER.

Electric Co-ops Conduct Third Multi-Pollutant Control Technology Demonstration

Stanton, ND - The Cooperative Research Network (CRN) and eight Generation and Transmission cooperatives (G&Ts) are partnering with ClearChem LLC on a demonstration of new technology to reduce sulfur dioxide emissions at a plant owned by Great River Energy.

This test is the third in a series of demonstrations spearheaded by NRECA's Cooperative Research Network and funded by a group of cooperatives seeking cost-effective environmental control technologies that will enable them to retrofit existing coal-fired plants to meet new federal environmental standards.

This demonstration will test the effectiveness of ClearChem's Furnace Sorbent Injection (FSI) of micronized limestone. Environmental Energy Services, licensed applicator of the ClearChem FSI, is also participating in the demonstration.

Since 1990, cooperatives have reduced both sulfur dioxide and nitrogen oxide emissions by 65 percent nationwide. New air quality standards, including interstate emission reduction initiatives, as well as regional haze requirements, are driving further reductions.

CRN is testing combinations of emerging and commercial technologies to find methods that can meet new standards affecting a range of coal-combustion emissions, including SOx, NO2, mercury and acid gases. The demonstration is occurring at Great River Energy's Stanton plant near Bismarck, ND. CRN has successfully conducted demonstrations of other technologies at San Miguel Electric Cooperative's San Miguel plant in Texas and Arizona Electric Power Cooperative's Apache plant in Arizona.

Coal is an important fuel for the nation's electric co-ops: in 2012 coal accounted for roughly 70 percent of co-op power generation. Member-owned, not-for-profit cooperatives are actively seeking cost-effective technologies to enable our coal fleet to continue to provide affordable electricity to co-op consumer-members across the country.

The National Rural Electric Cooperative Association is the national service organization that represents the nation's more than 900 private, not-for-profit, consumer-owned electric cooperatives, which provide service to 42 million people in 47 states.

Ameren's Largest-Ever Transmission Project Approved by Illinois Commerce Commission, Will Bolster Reliability and Deliver Renewable Energy

St. Louis, MO - An order issued by the Illinois Commerce Commission (ICC) paves the way for major new investment by Ameren that will create jobs, enable the delivery of renewable energy and improve the reliability and efficiency of the electric power grid.

Ameren Transmission Company of Illinois (ATXI), a wholly owned subsidiary of Ameren Corporation (NYSE: AEE), has received approval from the ICC to build the majority of its nearly 400-mile, approximately $1.1 billion Illinois Rivers transmission project. The project consists of a new 345-kilovolt transmission line crossing the Mississippi River near Quincy, Ill., and continuing east across Illinois to the Indiana border. This is the largest transmission project in the corporation's history and the largest single investment by the corporation since the early 1980s.

Right-of-way acquisitions for the approved portions of the project are expected to begin immediately with a full range of construction activities in 2014, providing a significant boost to the Illinois economy over the next five years.

"We are pleased with the ICC's decision confirming that the Illinois Rivers project is necessary and the best approach to addressing the reliability needs of customers and ensuring the development of an efficient electricity market. This project will help fuel the Illinois economy and provide customers access to a variety of energy sources, including wind energy," said Maureen A. Borkowski, president and CEO of ATXI.

The ICC agreed with and supported the need for this new line and granted a certificate of public convenience and necessity for seven of nine proposed segments on the route and three of nine proposed bulk substations. ATXI is moving forward on the approved portions of the project. The ICC noted the remaining two segments were not approved due to lack of time and evidence to determine the most cost-effective route. ATXI plans to request a rehearing to determine the appropriate routing of the two segments and the location and need for the substations that were not approved.

The project previously received approvals from the Federal Energy Regulatory Commission and the Midcontinent Independent System Operator, Inc. (MISO), a regional transmission organization serving an 11-state region and the Canadian province of Manitoba.

Ameren Transmission Company of Illinois is a subsidiary of Ameren Corporation dedicated to electric transmission infrastructure investment, expanding Ameren's already robust transmission system of more than 7,400 circuit miles of high-voltage transmission lines in Illinois and Missouri.

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NEEA and regional utilities successfully train the region to think smart about energy savings

Organizations and companies in the Northwest gain competitive advantages while cutting costs through NEEA's training and certification programs

Portland, OR - Northwest Energy Efficiency Alliance (NEEA), in collaboration with its utility partners, continues to successfully train the region through training and certification initiatives that span industries, from commercial building owners to trade organizations that represent thousands of members.

Building Operator Certification (BOC®) is a credential program offering hands-on training in HVAC, lighting and energy benchmarking for the region's building maintenance employees, developed and initially funded by NEEA from 1997 to 2002. Through BOC training, employees gain the experience and competitive knowledge to help facilities improve their building energy performance. BOC has become a self-sustained credential program now available in 28 states as well as Canada, and has certified more than 9,000 professionals nationwide.

In an effort to reach more organizations and companies that operate buildings in the Northwest, NEEA partnered with BOC's national program. NEEA's Regional BOC Expansion initiative aims to accelerate adoption of energy efficiency practices by addressing market barriers to participation in BOC, such as lack of time, ability to pay, lack of service in rural markets, lack of awareness, and product performance standards. The goal of the initiative is to increase the value placed on BOC by employers and operators, which will lead to persistent energy savings over time.

By developing a regional market for educated and certified building operators, NEEA will work to achieve lasting improvement in the energy-efficient operation and maintenance (O&M) of commercial buildings serving K-12, government, higher education, healthcare, commercial real estate, hospitality, and manufacturing across the Northwest.

"BOC positively impacts the commercial building and commercial facilities sector in the Northwest and is critical to saving energy throughout the region," said Susan E. Stratton, NEEA's executive director. "The region's commercial building owners and facilities managers now know the value of energy management, understand the business case for energy efficiency and have the knowledge to stay competitive."

BOC teaches facility managers, building operators, maintenance personnel, and others who monitor commercial building systems how to reduce energy and resource consumption in the facilities that they operate. BOC not only provides training but also lets participants take advantage of local utility initiatives and programs and the knowledge base of these programs for guidance.

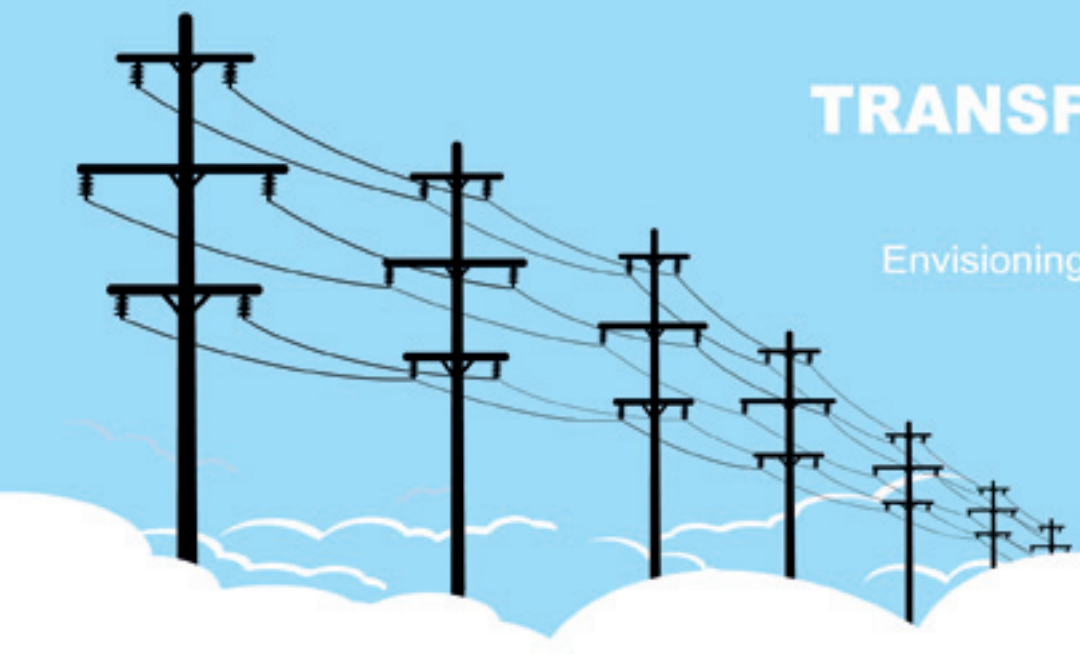
"NEEA's role in training our building-owner and maintenance customers gives them the knowledge to save energy usage in their buildings in our service area and the region, and to effectively leverage local utility energy efficiency programs," said Sheryl Anayas, program manager on PSE's Building Performance Team. "BOC training is very hands on, requires the completion of specific projects for certification, and offers specialized classroom training in HVAC, lighting and benchmarking. Bringing these skills into the commercial marketplace is crucial to our customers' success."

Chris Hunsaker, HVAC lead, building engineer for the Seattle Mariners, at Safeco Field, enrolled in BOC and scored great success from the training he received. By taking courses while on the job, Hunsaker was able to complete his certification while applying his BOC training knowledge to his role at Safeco. "I learned a lot about energy usage, gained competitive information about utility costs, and received a broader knowledge on the costs to run a facility," said Hunsaker.

One example of his success was real-time energy savings at Safeco. "We had domestic water boilers that weren't running efficiently. We installed a control system at a very small cost and within six months saved almost a quarter of a million dollars," said Hunsaker.

At 16 years, BOC is the longest-running energy efficiency training and certification program in the industry and has demonstrated increased energy savings. Regionally, based on the estimated 286,000 square feet managed by each certified operator, estimated annual savings are $20,000.

To learn more and watch video case studies of successful graduates of NEEA's BOC initiative, please visit *www.neea.org/BOC*.



THE GRID TRANSFORMATION FORUM

Envisioning the 21st Century Grid

Getting the Jump on Blackouts

We are speaking with Richard Dewey, Senior Vice President and Chief Information Officer of the New York Independent System Operator (NYISO). The company is among the leaders on the continent working to prevent an occurrence like the 2003 Northeast Blackout from ever happening again. Under his leadership, the NYISO Information Technology Group has been spear-heading smart grid initiatives in concert with the U.S. Department of Energy.

EET&D: 2013 marks the 10th anniversary of the 2003 Northeast Blackout. What are some of the key initiatives NYISO/NYS have undertaken to help avoid another similar event from happening in the future?

Dewey: In 2010, the NYISO announced it would administer and participate in a statewide, $75 million, federally backed smart grid initiative to improve grid reliability and operators' capabilities to monitor real-time conditions. The initiatives were supported by a U.S. Department of Energy Smart Grid Investment Grant (SGIG) of more than $37.8 million, funded through the American Recovery and Reinvestment Act of 2009. That project was completed in June of this year.

Concurrently, the NYISO embarked on a major infrastructure program that included construction of a new, state-of-the-art power control center adjacent to its headquarters building, near Albany, N.Y. Completion of that project is scheduled for this November.

Completion of the smart grid and control center projects strengthens the NYISO's ability to fulfill its core mission of maintaining reliability of the state's bulk power system.

EET&D: Describe the key elements of the NYS SGIG initiative.

Dewey: As part of the ARRA, the DOE provided smart grid grants to independent system operators, transmission companies and other U.S. utilities to install more than 800 networked phasor measurement units (PMUs) that rapidly measure and report system conditions.

As the grant recipient and administrator for New York's SGIG program, the NYISO worked with the New York State Public Service Commission (PSC) and the state's eight transmission-owning utilities and power authorities to deploy PMUs in 41 substations throughout the state. New York's SGIG program also supported the deployment of new capacitors at 234 locations across the state to improve the control and coordination of voltage on the New York power grid. These capacitors will improve the efficiency of the bulk transmission system by reducing the amount of electricity that is lost when carried over long distances—thus reducing electricity costs in New York by approximately $7.6 million per year.

EET&D: What are some of the benefits and capabilities of the PMU technology?

Dewey: In the final report on the 2003 blackout from the U.S. – Canada Power System Outage Task Force, the installation of PMUs was one of the key recommendations for minimizing the likelihood and impact of future grid disturbances. The report also identified the potential use and benefits of telemetry data if the PMUs were networked, time aligned and streaming into control rooms. The term synchrophasor measurement unit was coined to point out that the 'time synchronization' in these products adds value into the telemetry data being collected. The analysis of the PMU data collected after the 2003 blackout was severely hindered because there was no common time source for the devices deployed at that point in time. The installation of new PMUs and integration of the data provided will improve grid operators' visualization capabilities and situational awareness.

By placing PMUs throughout the country, regional system operators can better assess grid disturbances that have the potential to be wide ranging and affect other areas of the country and potentially prevent large-scale outages like the 2003 Northeast regional blackout before they occur. PMUs are considered to be the 'eyes and ears' of the grid system, providing operators real-time feedback on grid conditions. The technology is designed to relay system conditions at a rate of 60 times per second – 360 times faster than previously available. As a result, the PMU network will improve grid operators' ability to more quickly detect irregularities, predict problems and take corrective action to maintain reliability.

EET&D: What is the status of New York's SGIG-funded smart grid upgrades?

Dewey: Final installation of the PMUs and capacitor banks was completed in June 2013. When New York's PMU network is connected with neighboring grid operators, it will provide broader situational awareness of grid conditions throughout the eastern United States and Canada. Following completion of the equipment installation, the NYISO will continue to report to the DOE on the results of the SGIG projects for an additional two years.

EET&D: Discussions about smart grid technology inevitably lead to questions about cybersecurity. What kind of measures is NYISO taking to address concerns about cybersecurity?

Dewey: Cybersecurity is a serious concern that requires constant, sustained vigilance. The NYISO has included cybersecurity reviews and assessments as part of the SGIG project. Each utility has its own policies pertaining to both physical and cybersecurity, and systems developed as part of the SGIG project have been designed and installed to comply with these policies.

EET&D: Please describe the importance of the new primary power control center.

Dewey: The 64,000-square-foot control center will serve as the primary operations center for the NYISO. The new facility is being developed to replace the existing, 42-year-old control center in western Albany County. The older site's systems will be upgraded as part of this effort, satisfying the requirement of having a fully functional primary and backup control center.

The new control facility is designed to meet 21st century grid reliability requirements through the use of the latest control technologies and advanced visual displays designed to improve the NYISO's ability to receive, process and monitor changing conditions throughout the region.

The new control center's 2,300-square-foot video wall is North America's largest utility industry installation. Its 100, 80-inch diagonal LED screens are stacked 25 wide by four high, spanning a space 131.5 feet wide and 18.3 feet tall.

Its central section of display screens will feature a single-line system representation of the New York Control Area, providing more than 3,000 live status points presenting line flows, line limits, transformer loading, voltages and generator output. Two arrays bordering the center display will show regional electric system information, weather and lightning-strike data, load forecast and other information that can be customized to assist operators to forecast and mitigate potential system disturbances.

With improved digital data capacity, the new control center equips the NYISO to better integrate renewable resources, such as wind and solar power systems. It also will help to address the additional responsibilities resulting from the interregional coordination involved in the NYISO's Broader Regional Markets initiative, the growing need to coordinate natural gas system operations with the electric system and the increased span of control required by the expanded definition of the bulk electric system by the Federal Energy Regulatory Commission.

EET&D: Finally, what are some other key NYISO priorities not covered by the federal ARRA-SGIG initiative?

Dewey: There are a number of key priorities and challenges, including: continued progress with our neighboring regions on the 'Broader Regional Markets' initiative that will expand competition and enable grid operators in the region to better respond to dynamic market and operating conditions across their borders by broadening the pool of available resources; upgrading the transmission system to address aging infrastructure and remedy limitations on power flows to high-demand regions of the state; implementing FERC Order 1000 and meeting the requirements for a regional transmission planning process that includes consideration of public policy requirements and allows competitors to make new transmission system investments; maintaining adequate supplies of power resources as older, less economic generation retires and new power technologies are developed; managing the impact of increased natural gas supplies and growing power system reliance on generating facilities fueled by natural gas; and implementing a new capacity zone to ensure the NYISO's capacity market provides appropriate and accurate price signals to market participants in order to preserve reliability in an economically efficient manner.

EET&D: We are very grateful Richard that you have been able to take some time from what I can bet is a crazy schedule to speak with us. The Blackout must certainly rank high on many peoples lists of what they never wish to see repeated. It's good to know major operations like NYISO are at the forefront seeing a calamity like that doesn't hit again.

About the interviewee

Rich Dewey is Senior Vice President and Chief Information Officer of the New York Independent System Operator (NYISO). The NYISO Information Technology Group is responsible for delivering IT products and services to evolve the wholesale electricity markets; development, deployment, support, and maintenance of all NYISO software; managing compliance of software and systems with the federal tariffs governing the NYISO; technical design, support and maintenance of the NYISO's communications systems and its computing infrastructure; and maintaining the NYISO's physical facilities and enterprise security.

He was promoted to the Senior VP & CIO position in April 2010, having served as VP & CIO since 2008. He has also served as the NYISO's Director of Product & Project Management, Manager of IT Strategic Software Development and Manager of IT Quality Assurance. Before joining the NYISO in 2000, Mr. Dewey worked as an IT manager for Husky Injection Molding Systems in Pittsfield, Massachusetts and as a manager of corporate network services for the Niagara Mohawk Power Corporation in Syracuse, New York.

He earned a Master of Science degree in Computer Engineering from Syracuse University and a Bachelor of Science degree in Electrical and Computer Engineering from Clarkson University in Potsdam, New York.

GREEN OVATIONS

Innovations in Green Technologies

Green Data Walls

Sustainability and Scalability in the Control Room

By James Chan, Vice President, Marketing

Whether you're designing a new network operation center or upgrading an existing control room, it's important to evaluate technology based on environmental impact, and maximize capital expenditures while minimizing cost-of-ownership. Often sustainability and scalability can meet these needs, particularly when implementing or improving a large display wall system.

With the new millennium, there is a whole new way of looking at capital equipment investments and environmental responsibility, and the challenge for designers, consultants, integrators and architects is to make installations cost effective, efficient, and environmentally friendly.

Some manufacturers realize that sustainable and scalable video display wall systems are a growing concern of socially responsible organizations. Adding to the stress of choosing to upgrade or refresh such display systems in mission-critical applications is staying educated and informed about the latest available options. It's a chore many people often postpone until the very last minute, only to make hasty decisions that may not serve the best interest of the organization.

Luckily, now upgrading and refreshing video walls is much easier and less painful with new scalable, next-generation display wall products that have modularity and flexibility built into each cube. Decisions regarding display size, screen type, resolution, input types, light sources and maintenance access can now be made by end users, and new video walls can grow and change alongside business requirements.

Invest Once and Reap the Benefits for More than One Generation

The days of display manufacturers deciding what features your display has in your control or operations center needs are over. Next generation display walls are designed and built to be modular and scalable, offering à la carte components so you can pick and choose how a display wall is built and equipped.

With the help of experienced consultants, you can determine what is truly needed based on your business requirements, then select the components and build your wall from there. And when these requirements change or increase, an upgrade involves only a few components instead of an entirely new re-installation. You don't need to undertake a huge project of demolishing an old display wall and installing a completely brand new wall, only to be redone every five to seven years.

A modular display wall allows you to move from XGA to SXGA+ by simply changing out the optical engine and utilizing the same exact cube cabinet and screen, which instantly increases each display screen's resolution by over 86 percent. The same type of simple engine upgrade can also move you from single lamp engines to dual lamp engines, or even to state-of-the-art LED-based engines with the same or higher resolution. Furthermore, wall modularity allows you to enlarge a cabinet and screen size using exactly the same engines you already have. All of these available options are purely a function of your requirement and choice, which keeps costs down.

Maximizing the reusability factor of a display wall as your organization changes and grows also reduces a lot of unnecessary waste. Three consumable components that need to be replaced most frequently in a continuous operating environment are the color-wheel, fan motor, and lamps. In next-generation scalable display walls, all of these are improved to reduce consumption rates of these parts despite continuous operation.

With the option of using or upgrading to an LED-based engine, you can use an engine that operates mercury-free and offers better longevity in lamp life. Color wheels and fan motors are now also designed and built with durable, heat-resistant ceramic bearings that allow these components to last up to 100,000 hours…that's more than 11 years, compared to currently available non-modular walls that need replacement parts in less than half the time.

Choices, Choices, Choices

This simple idea of scalability transfers the power of choice to you, the end user. New, next-generation display walls are now simply flexible and truly customizable, and most importantly, scalable and sustainable, which maximizes reusability and reduces waste. From input cards and color wheels to brightness levels and maintenance access, now you can configure the display to be exactly what you need; nothing more, nothing less.

Input cards

Input cards determine the input connections that connect your cameras, data feeds, and computers to the display wall cubes, and are one of the most essential considerations in your display wall choice. Previously, if the current display wall supports only analog inputs but your newer system supports digital signals, signal converters were necessary for the wall to display properly, which increased the cost of the display. By using a modular design, if you need multiple digital inputs, you choose your suitable input cards; simply add on and take out these input cards as needed, saving time and money.

Color wheels

The color wheel is the part of the cube that literally generates the 'color' it will display, and different color wheels provide different color and brightness level for the display wall. Choosing the right color wheel for your display wall is crucial since vital decisions will be made from information on the display, so settling for the 'manufacture's standard' color wheel is no longer appropriate or necessary. Moreover, whichever color wheel you choose, a new long-life color wheel can last up to 100,000 hours or over 11 years of continuous use.

Brightness Levels

Getting more for less is always a good way to justify upgrades and major purchases. Displays are often treated as short-term investments because of their useful life span, but with next-generation display wall cubes, you can choose the features and settings to fit your needs. You now have a wide option of operating times ranging from 10,000 hours to over 60,000 hours. Your control room or network operation center can go from over one year of 24/7 operation to over six by just changing your optical engine or by adjusting the brightness levels. That is the true beauty of scalability: you choose the components that fit your needs now and reap the benefits for years to come.

Maintenance Access

Depending on the size of the operation center, space can get cramped and big bulky rear projection cubes aren't always practical or appropriate. Having a choice between front or rear access maintenance allows for sleeker room designs and helps save space.

Front access display walls can be placed with the back of the display completely flush against the wall. The display opens from the front and virtually all of the maintenance can be performed from the front, freeing up anywhere from 2 to 10 feet of space that would otherwise have been needed for rear access to the cubes.

In larger installations where the video wall itself is integrated into the architecture and structure of the building, rear access display cubes are typical. And with modularity, future upgrades for this type of wall do not require a new architectural venture and the costs associated with a major overhaul.

Ensure State of the Art Technology for Your Network Operating Center with Minimal Cost

Modularity helps customers stay current with new technology without having to undergo major re-work and or re-installations; you can upgrade and refresh your display as often as your budget permits. As new technology comes to the market, upgrades can be easily planned and budgeted.

With new modular display walls, the display wall structure can stay as long as it's stable, and upgrading or changing internal components is all that's needed. This allows your display wall to recover your investment and pay for itself long before you need a completely new one.

It is simply our social responsibility to reduce waste and reuse as much as we can. Now, next generation display wall systems enable you to make that responsible decision without compromising on technology. Measure twice, install once, and use your video walls for a long, long time.

About the Author

As vice president of marketing at Mitsubishi Electric Visual Solutions, Inc., **James Chan** oversees product and brand marketing as well as marketing communications for its projectors, televisions, professional-grade LCD monitors, display wall products, and medical and photo printers. Chan, a 20-plus year marketing veteran, joined Mitsubishi in 1999 as product manager for projectors, later promoted to director and subsequently senior director of product marketing, while the breadth of the product line under his management expanded. Prior to Mitsubishi, he worked at Panasonic and Viewsonic. Mr. Chan holds a bachelor's degree in computer science from De La Salle University in Manila in his native Philippines, and received his MBA in 1999 from California State University, Fullerton.

Next Generation Instrument Transformers

How Medium Voltage Optical Sensors Reduce Peak Loads, Improve Energy Efficiency and Prioritize O&M Investments

By Don Parker, P.E. and Trey Beasley, P.E., MBA

To meet regulatory, business and customer satisfaction demands, utilities are seeking more effective technologies to reduce peak loads to improve reliability and to effectively make the right operating and maintenance investments. Medium voltage (MV) optical current and voltage sensors, as a next generation instrument transformer, meets these challenges.

MV Optical Current & Voltage Sensor Design

To manage the challenges of 21st century demand, the power grids of the future must enable intelligent communication across sensing, measurement, and control layers.

As a next-generation instrument transformer with very high dynamic current range, best-in-class accuracy, and high frequency response, MV optical current and voltage sensors facilitate the effective control of the distribution systems through real-time measurement of voltage and current.

Next generation optical sensors measure voltage and current using specially engineered crystals with light passing through fiber optic cables.

Sensor voltage measurement uses the Pockels Effect. When the light passes through the crystal inside the electric field the light polarizes proportionally to the electric field strength.

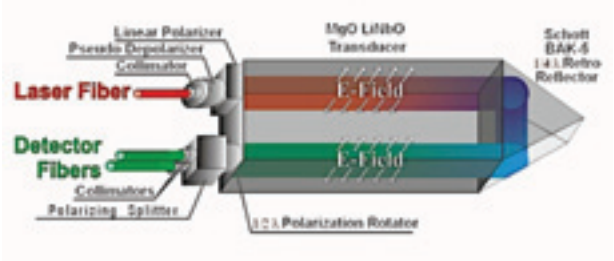


Fig. 1 – Pockels Effect Schematic

Similarly, the Current measurement uses the Faraday Effect by rotating the polarization of the light in proportion to the magnetic field strength.

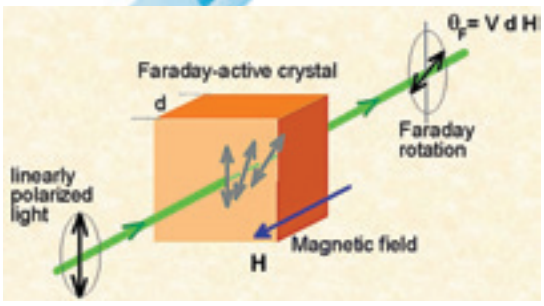


Fig. 2 – Faraday Effect Schematic

The integral of the magnetic field surrounding the conductor has to be measured to eliminate adjacent line magnetic interference and provide a universal solution regardless of the type of cable. This is accomplished with the use of a magnetic concentrator.[1]

Why Optical MV Sensors Are Considered Next Generation Instrument Transformers

To optimize energy efficiency applications such as Demand Response and Volt/VAR control, a MV sensor or instrument transformer with high accuracy is required.

For Fault Detection and Service Restoration applications, high dynamic current range and real time response are required.[2] For Power Quality applications, the most important data measurement features are high frequency response and very high signal sampling rate.

MV optical current and voltage sensors deliver:

- **Very High Accuracy**: Measuring 15,000 times per second, optical MV sensors are accurate within ±0.5% in the outdoor environment from -25C to +70C

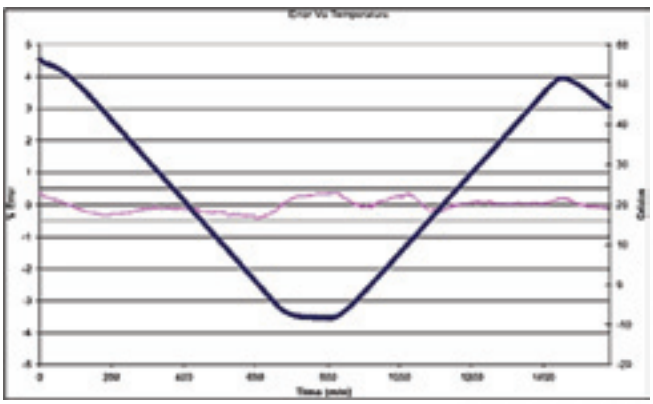


Fig. 3 – Accuracy of ±0.5% over Time and Varying Temperature

- **High Dynamic Range:** The MV optical sensor can measure near-DC signals and beyond 20 kA – a feature impossible with instrument transformers. The high dynamic range eliminates the need for parallel current transformers.
- **Versatility:** The optical sensor's lightweight design and isolated path to the electronics enable the sensors to be easily and economically installed along feeders – delivering accurate real time system information for more informed decision-making.
- **Flexibility:** Optical sensors are applicable across the full range of medium voltage systems. The same sensor and electronics can often be used for multiple situations reducing inventory, minimizing training, and simplifying maintenance.

Optical MV Sensor Performance across Alabama Power's Distribution System

Alabama Power, part of Southern Company of Atlanta, Georgia USA, has been evolving its Distribution Automation system since 1989.[3]

Through a cooperative research and development program with the Electric Power Research Institute (EPRI) in a project known as Green Circuits, Alabama Power demonstrated that energy efficiency improvements and voltage management techniques could reduce energy demand.[4,5]

To maximize the efficiency opportunities, Alabama Power found it imperative that information about the distribution feeders be available for each phase and at multiple locations on the feeder.[6,7] Alabama Power decided that this could be best accomplished by using instrument transformers (MV sensors) to:

- Balance the loads equally between the phases on the three phase feeders
- Improve the feeder's power delivery efficiency (power factor)
- Level the feeders' voltage profile from the substation breaker to the end of the line
- Lower the voltage setting at the substation

To ensure accurate information, Alabama Power used one sensor per phase and three or more sets of sensors per feeder.

Significant Voltage and Efficiency Improvements

Deploying post type MV current and voltage sensors, Alabama Power captured a one percent reduction in voltage (on average) at the MV substation. The field trial provided an efficiency improvement of the delivery of power between 2.01 to 2.14 percent.

With higher precision sensors this performance can be improved. As can be seen in Figure 4, a higher accuracy sensor enables the utility to increase demand response capacity while meeting the consumer ANSI C84.1 requirement for delivery between 114V and 126V.

Sensor Accuracy Comparisons for Enabling CVR

Substation Customer Target Voltage	Substation Customer Voltage Range		Sensor Accuracy	Target End of Line Voltage	End of Line Voltage Range		Total Responsive Demand		Total Responsive Demand
120	122.4	117.6	2.00%	116	118.3	113.7	2.86%	-0.28%	2.58%
120	121.2	118.8	1.00%	116	117.2	114.8	3.81%	0.74%	4.55%
120	120.6	119.4	0.50%	116	116.6	115.4	4.29%	1.25%	5.53%
120	120.4	119.6	0.30%	116	116.3	115.7	4.48%	1.45%	5.93%

Fig. 4 – Sensor Accuracy effects on Responsive Demand

Benefits of MV Optical Sensors

MV sensors can detect which feeder line segment has had a fault. The remote control of line switches allows the opening of switches on either side of the fault to isolate it. Subsequently service can be restored to the un-faulted sections by reenergizing the un-faulted sections by remotely closing breakers, line reclosers and line switches. This action greatly reduces the outage time to those customers not in the isolated line segment.

The increased functionality of the optical sensor also provides more accurate line flow values. This information delivers more accurate calibration factors for the line's power flow analysis program.

Prioritizing O&M Investment

Typically, line power flow analysis (LFA) is the basis for determining future system improvements and for allocating capital budget funds. Having more accurate data assures that capital budget dollars will be allocated where most needed. More importantly, accurate data ensures that *capital investment will not be allocated where it's not needed*.

If utilities are to conquer the challenge of increased energy demand, contrasted with energy efficiency mandates, they must seek new, more effective technologies. Deploying optical MV current and voltage sensors across differing voltage systems and configurations offers dynamic system operation, improved efficiency, and increased reliability.

Any extension of asset life and increased control of field equipment offers significant financial impact. As an early adopter of MV sensors, Alabama Power has used this real-time data to target resources, improve system reliability, and more accurately manage its loads across their service territory.

"Utilities are seeking options to better manage demand, resources, and infrastructure costs," says Trey Beasley, P.E. of OptiSense Network. "Having real-time voltage, current and power factor data allows utilities like Alabama Power to effectively manage the efficiency, reliability and demand response of their distribution systems."

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About the authors

Don Parker, P.E. has more than 40 years of experience in distribution automation, power quality and reliability, and intelligent devices. Don currently serves as Principal Engineer with Alabama Power, a Southern Company. Don is a member of IEEE Power Engineering Society with active participation on the Switchgear Committee, Power System Relay Committee and Surge Device Protection Committee. He has served as Technical Advisor on numerous projects with NEETRAC. His presentations on MV Optical Sensors, CVR and VV include DistribuTECH 2012, IEEE ISGT 2012, and IEEE PES GM 2011.

Trey Beasley, PE., MBA is a licensed Professional Engineer with more than twenty years of utility industry experience. Holder of two patents on power delivery methods, Trey was instrumental in planning, project management, operations and maintenance of power systems at TXU Energy. While there, Trey managed TXU's renewable technology showcase – one of the nation's first solar and wind generation proof of concept test sites. TXU is now one of the largest purchasers of renewable energy in the USA.

Formerly the Director of Channel Alliances with Oracle Utilities, Beasley serves as Vice President of Business Development at OptiSense Network LLC. He holds a Bachelor of Science in Electrical Engineering from Texas A&M University and an MBA and a Masters of Finance from the University of Texas at Dallas. Trey is an IEEE member.


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The Value of AMI

It's so much more than billing

By Joseph O. Wambaugh,
Senior Vice President

Billions have been invested, and will continue to be invested, in the implementation of advanced metering infrastructure (AMI) at electric, gas and water utilities. These AMI deployments are achieving many of the benefits identified in their respective business cases and AMI has become a critical infrastructure for these utilities. However, these early business cases relied on the basic benefits associated with meter reading and dynamic pricing/demand response. The potential value of the millions of grid sensors (yes, these aren't just meters) with real-time communication has yet to be fully realized.

Two recent research studies[1] have one remarkable and similar message – half of the utilities that have implemented AMI solutions are only collecting and using the data for basic billing purposes. It's no wonder why some utility executives have begun questioning the value of what was spent for AMI. Implementation of AMI has the potential to bring extensive value to the rest of the utility enterprise. This is best represented by FortisAlberta's 2008/2009 Tariff Application which states:

"The diverse benefits associated with a fully provisioned AMI system extend far beyond improvements in billing accuracy and the replacement of manual meter reading. For both customers and retailers this includes increased accuracy of outage information, quicker outage response and restoration, and more timely and detailed customer energy usage information. Additional operational benefits include more efficient distribution system planning, voltage monitoring, rate profiling, and the ability to implement remote disconnect and reconnect functionality."

"Half of the utilities who have implemented AMI solutions are only collecting and using the data for basic billing purposes."

It's not a meter, it's a sensor

Today's AMI meter is so much more than a measurement device to produce a customer's bill. Beyond measuring and reporting energy and power values, today's AMI meters measure and report instantaneous and average volts and power quality. These meters have configurable intelligence to provide real-time alerts when power is lost, power is restored, a condition indicating tampering is identified, power quality limits have been exceeded and thresholds of energy consumption have been surpassed. Figure 1 illustrates the extended capabilities of an AMI meter.

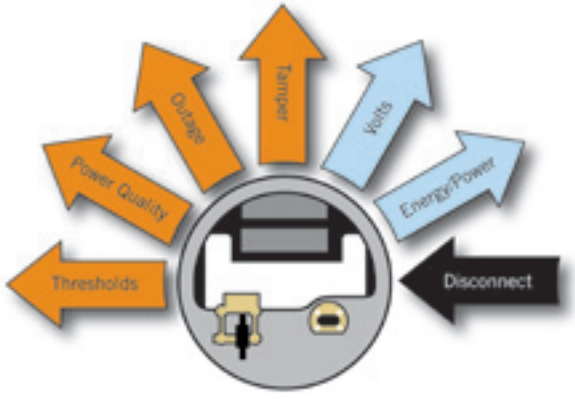

Figure 1. Capabilities of an AMI meter extend far beyond billing

In addition to the type of data that can be collected from AMI meters, the frequency and latency of delivery of the AMI solution allows for data to be collected and delivered daily, several times per day and even every 5 or 15 minutes. Properly configured, the AMI solution should be able to collect, validate and distribute grid sensor information at any endpoint as required to better operate, analyze and optimize the electric distribution grid. Several applications and services have emerged lately to use this data to better detect and manage outages, execute new demand response programs and to better optimize the distribution voltage.

Value in distribution management

Real-time alerts and alarms from AMI provide quicker outage detection along with power restoration information used by sophisticated outage management systems (OMS) and enhanced business processes to reduce outage durations and improve communications to customers.

The integration of AMI with OMS, and the associated challenges, has been written and talked about for several years. Outage management systems have been enhanced to leverage the integrated AMI and recognize benefit from:

- Faster outage detection and isolation by utilizing the outage alerts to augment IVR and SCADA events. Some utilities have reported an improvement in reliably identifying power outages of up to 15 minutes using properly filtered and validated AMI outage reports in addition to customer calls
- Validate restoration activities by accepting power restoration alerts and proactively requesting power status from the AMI meters
- Identify nested outages where power has not been restored
- Validating single lights out calls prior to dispatching trouble crews by "pinging" the AMI meter

One utility, JEA in Jacksonville, FL, is going the extra mile for its customers by integrating AMI, OMS and their customer portal to provide customers with individual notification of power outages, power restorations and cause of the power outage. While currently in pilot form, this capability will be made available to all customers with the goal that any customer should be notified of an outage or restoration within 15 minutes of occurrence and notified of the cause of the outage within 24 hours.

Conservation Voltage Reduction (CVR) has been used for many years to maintain the voltage on the distribution feeders in the lower band of the National Service Voltage Standard (ANSI C84.1). This reduction in voltage provides demand reduction by lowering the energy consumption of the end consumers as well as providing some improvements in power system efficiencies. Recently, utilities have been incorporating AMI data as feedback into the CVR programs to further lower the distribution voltage, gain more confidence that the end consumers are unaffected by the voltage reduction and maximize the value of the voltage reduction. In addition to voltage reduction and voltage management, the power quality alerts and collected voltage data allows the utility to proactively identify and resolve situations before they lead to high voltage complaints and even damage to customer equipment. Dominion Virginia Power submitted a business case for the deployment of AMI for which the benefit from CVR provides the majority of the benefits with small contribution from storm restoration, customer service and metering completing the business case. Figure 2 illustrates how voltage can be lowered with AMI data. Voltage control without AMI feedback (see left side of figure) results in higher voltages and increased losses, while voltage control with AMI feedback (right side of figure) yields a tighter range and lower losses

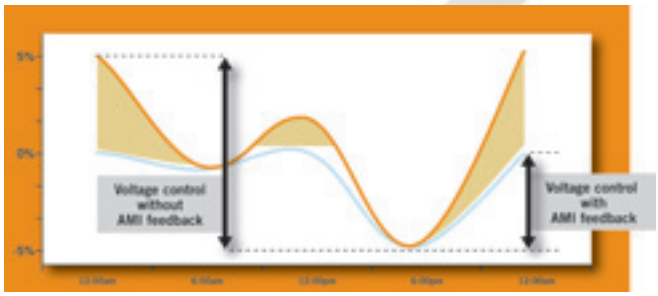

Figure 2. Improving voltage reduction with AMI data

The granular (5 to 15 minute interval kWh) load data from every endpoint of the grid should fundamentally change the approach which engineers and planners take to design, grow and maintain the electric distribution network. Management of distribution assets and network capacity is typically performed using engineering models built from many years of experience. The load data provided from AMI can be used in these models to refine and improve the accuracy and provide various seasonal and loading scenarios for planning purposes. One benefit which utilities are realizing from this load information is the management and reduction of distribution line losses.

Distribution line losses are power that is generated, yet not delivered, and consequently, not billed for. Reduction in those losses can save a utility the cost of energy (either the wholesale price of energy or the marginal price, depending upon the regulatory model for the utility) that would have been required to generate the 'lost energy.' A reasonable expectation for improvement of up to one percent in technical and non-technical (theft) losses can result in real savings for the utility. The capture of these benefits is enabled by AMI, but requires the utility to invest in personnel and equipment to realize the value through:

- Feeder rebalancing
- Better capacitor placement and utilization
- Improved conductor sizing and, where appropriate, conductor re-sizing
- Optimization of voltage equipment (load tap changers and regulators)
- Capacitor automation
- Loss minimization functionality provided via DMS

Finally, the flexible and configurable features of the new AMI solution allows the utility to tweak and adjust the network and alerts to tune the operation of the electric grid and continue to gain incremental improvements in efficiencies and utilization. The AMI meters (sensors) and network is a dynamic system which allows the utility engineers to adjust the type and granularity of the data as well as the many alerts and quality monitors embedded in the solution.

While not widely implemented, the AMI solutions are quite capable of supporting the following functions and the utility engineers and management should be insisting on these capabilities:

- Establish bellwether meters and near real-time streaming energy and voltage data
- Individually, or as a group, settable thresholds and alerts from service delivery points
- Identify groups of service delivery points for purposes of aggregated energy consumption and the delivery of historical and streamed aggregated data
- Coordination of communications configurations to maximize data delivery and minimize latencies based on immediate needs for information

Barriers

As the utility leverages the advanced metering infrastructure and AMI data, the utility engineers and managers begin to realize the range of value that can be realized from this installed infrastructure. Those utilities who were the early adopters of AMI (or AMR) have achieved value from their networks that was never contemplated when the systems were installed 15 or more years ago. So, if many see that the value of AMI extends well beyond just meter reading for billing, why aren't enough utilities taking advantage of this value? In some cases, the initial implementation of AMI did not account for anything other than simple billing during the design and configuration of the meters and information systems. It is not uncommon to hear "We only saw the need to read for billing" when asked for the requirements a utility envisioned. In other cases, the project team is so focused on installing AMI meters and the requisite data cleanup issues that any activity beyond basic billing is deferred. And most disconcerting was a report from a distribution operations manager at one large utility who said, "Every time we ask for access to the AMI system and data, we get a hand in the face and are told that this is a critical billing system."

Overcoming barriers

The first step of any benefit realization is to fully define what you really want for the system and to ensure that the AMI solution has been configured to deliver all of the available data and is operated in a manner that ensures the reliable capture of 100 percent of this data every day. The sensors (meters), communication network and interfaces should be configured with all uses of the solution in mind and all potential users of the solution should participate in the initial requirements development and design to ensure that their needs are accounted for. Throughout the implementation and deployment it is important to avoid thinking: "Well, I don't need this for billing." As an example, one of the early adopters of AMI specified the need for only index values of kWh (e.g. 12345 kWh) only to discover several years later that 'beyond billing' users required data granularity down to the Wh.

The utility implementing an AMI solution should plan for multiple 'business releases.' The first phase of any AMI project is the initial configuration and integration of the critical 'meter to cash' systems needed to install and bill customers – AMI, MDMS and CIS. The second business release after this first phase should be focused at another business user such as distribution operations. These focused releases ensure that all users are prepared to use the data from the AMI solution and can plan the enhancement and integration of their systems and processes to enable the new capabilities and benefits. The 'beyond billing' benefits of AMI are only achieved with additional systems integration, disciplined execution of defined business processes and, in some cases, investment in infrastructure.

Finally, the utility needs to actively promote and encourage the use of the AMI solution. The best ideas for how AMI data can help improve efficiencies and existing systems will come from the engineers and technicians performing the day to day electric utility business. During one early AMI implementation, a planning engineer asked, "Can you provide data for all the meters on a transformer during the peak hours of the day?" This led to a quick information pilot and ultimately to a completely new approach to Transformer Load Management (TLM) which is saving that utility millions of dollars a year.

Conclusion

A properly designed and operated AMI solution should be able to deliver all of the intended functionality without impact to any individual user of the system or data. Utilities and their partners must design the solution and establish the operational structure so that AMI value and features are available as they are needed and flexible enough to support the new uses and opportunities that will arise over the next 15 years. The value of AMI extends to all parts of the utility organization and it is a critical platform to enabling many opportunities for efficiency, performance improvement, and customer satisfaction.

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About the author

Joseph O. Wambaugh is a Senior Vice President at UISOL (An Alstom Company) and manages UISOL's AMI and MDM practice. He has over 20 years of experience in defining, implementing and operating smart metering and meter data management systems for the utility industry. John holds an MS in Metallurgical Engineering.

Clamping Down on Inefficiencies

Vise Top Insulators and New Construction Standards Improve Reliability and Durability for Electrical Utility Company

By Tom Wilson

You hear about it every day: the grid is evolving further and faster with each passing service hour. There are new methods for setting prices, new devices for tracking peak usage. In every aspect of its operation, from the way it collects information to the way it distributes electricity, the grid is getting 'smarter.'

However, there are other effective ways for a utility to 'get smart' about its service, on the ground and out in the field. Many factors can affect a system's reliability, from employee training to the transformers, but oftentimes the best place to begin the evaluation of your system is with the physical lines themselves.

That's how Avista Utilities began their review in 2008. The company has worked in renewable energy in the Pacific Northwest since 1889, and now provides electric service to 361,000 customers and natural gas to 320,000 customers over a 30,000 square mile (77,700 square kilometer) service territory. Their customers include business, industry, universities, and consumers in eastern Washington, northern Idaho, and parts of southern and eastern Oregon.

"We decided to undertake an overhaul and simplification of our overhead construction standards," explained John T. Dunlap, Senior Electrical Engineer at Avista, "We've had some of our networks for more than a century, and you don't stay in business that long without always working to meet your customers' energy needs more reliably and responsibly. We wanted to take a long look at our systems and see how we could reduce the number of necessary service calls and minimize failures."

Avista discovered that by combining fiberglass arms and Hendrix Vise Top insulators they could improve reliability, reduce inventory, and simplify their overhead construction standards.

Analyzing the Findings

"One of the first conclusions we came to was that the weakest link in our system, the piece that had us out on service calls most often, was our wooden cross arms," said Dunlap. "The cross arm was almost always the first thing to fail on the distribution structures and it resulted in most of our initial service calls. By replacing the wooden arms with fiberglass, we could eliminate a lot of those issues."

"Next, we realized that we could improve our wildlife protection through the elimination of double arms," continued Dunlap, "Here in the northwest, ospreys are common, and a lot of our service territory runs along the rivers and waters where they live. It's essential for their safety that we prevent them from nesting on our lines. That also helps ensure the reliability of our electric system by eliminating some power outages, electrocutions and fires caused from nests.

"Without double arms, we also save on the labor and supply costs of constructing nesting platforms and relocating nests." However, in order to eliminate double arms, Avista needed stronger cross arms for dead-ending, as well as stronger tangent arms and cross arm pins to withstand the tensions resulting from the necessary angles.

Lastly, Avista decided to replace their porcelain insulators with Hendrix Vise Top insulators. Hendrix Vise Top insulators incorporate a clamping mechanism into the top of the insulator to provide quick and easy conductor installation without the need for additional tie products. Molded from a proprietary blend of gray, track resistant, high density polyethylene, they also offer higher impact, puncture, and UV resistance than porcelain alternatives.

"It's much quicker and easier to install than a tie-top insulator," explained Ken Woo, Director of Sales, Molded Products, at Hendrix Wire & Cable, "You don't need to purchase an additional tie to secure your conductor onto the insulator, and you don't need to train the folks who are performing the installation to use those ties. With these insulators, you just turn the bolt and install."

"In addition, the Vise Top can be used with all conductor types, bare or covered. It also conforms to the electrical and mechanical requirements of ANSI C29.5 and C29.6. It's much, much lighter than the equivalent porcelain product, and because it exceeds all the ANSI electrical and mechanical performance requirements, it'll perform a lot better as well."

The team at Avista was very impressed by the benefits of this product. "By using the Vise Top insulators, we were able to eliminate 40 different stock items," said Dunlap, "We can use one insulator for 35 kV, and one for both 15 kV and 25 kV. Since the Vise Tops simply clamp on, we no longer need to purchase and stock a large amount of ties. We've gone to Hendrix Vise Top insulators exclusively now, and our storekeepers are very happy. Not only does this keep our employees satisfied, it's also excellent for us from a cost management perspective, which is a benefit to customers."

Once Avista had identified these separate solutions and goals, they had to create a cohesive plan for integrating them into the existing system and future installations. This is where Hendrix came in.

Formulating the Solution

"The most critical part of this overhaul," explained Dunlap, "was that all these new materials worked together and were applied correctly. After all, we were rewriting the foundation of our construction standards. It was essential that the new standards provided a concise, easily applicable template that would ensure we consistently meet code in the years to come."

"There are a lot of variables and questions involved in formulating these standards," he continued. "For example, how much angle can we put on these pins for a given conductor size and span length?" To answer questions like these and provide accurate, application-specific information, Hendrix operates an engineering lab at its facilities in Milford, New Hampshire. The lab is capable of performing industry design tests as well as routine electrical and physical testing, so that customers can know what they need to ahead of time.

For this job, Avista sent Hendrix an assortment of cross arm pins and other materials for testing. "We performed a variety of tests for Avista," said Woo, "For instance, our technical staff performed Finite Element Analysis (FEA), a mechanical stress analysis which determined if the pins and insulators we provided would hold up under the stresses of moderate or severe angle applications. We also performed mechanical tests, such as Cantilever strength testing, to simulate the angles that these pins would be installed under. We ensured that our products were up to certification and exceed 3,000 pounds of force without any breakage."

Hendrix also provides post-mortem analysis after damage or failure in the field, as well as assistance in designing new applications. "Hendrix offers all of these capabilities in-house because many utilities do not have test facilities and labs of their own," explained Woo. "When we're able to simulate an application before it's out on the overhead line, it gives our customers that much more assurance that the product will perform. Electric utilities invest a lot in their lines, and it's important that they be able to predict how they will work. We're here to help them to do that."

Avista was very pleased with the knowledge and support that Hendrix's testing provided. Dunlap said, "We've worked with Hendrix on their underground cables for years, and we just have such a high trust level with them. They are tremendously supportive. If I've got an issue, they come out. They call on us. They solve the problem. I just sent Ken Woo several of the cross arm pins we were planning to use, and the folks at Hendrix did the rest. By the time they were done, we knew exactly how much tension to design for with our combination of vise tops and cross arm pins."

With the results of the testing, Avista was able to move forward with clear new construction standards. Their lines are now simpler to build, less likely to need repair, and composed of fewer pieces.

Conclusion

Avista is now prepared to take their electrical distribution to the next level. The new fiberglass arms provide a sturdier, more resilient replacement for the old wooden arms. The company will conserve costs and the environment by reducing the necessity for nesting platforms. Their streamlined stock is now easier to manage and more cost-effective.

"This is exactly the sort of project we're happy to undertake and proud to support," said Woo. "Hendrix was founded to manufacture innovative, space-saving, and cost-saving products like the Vise Top insulator, but a large part of our reputation is also built on excellent engineering and customer service. It was very rewarding to combine these two core competencies and create a more efficient, environmentally friendly network with Avista."

"I could not be happier with the way this project turned out," said Dunlap, "We have eliminated over 40 stock items, improved our wildlife protection, produced superior new construction standards, and removed the weakest links in our system. We believe that this new combination of fiberglass arms and Hendrix Vise Tops will get us through three inspection cycles, or over 50 years. Avista is proud to better serve our customers with the most advanced and efficient electrical distribution system we can offer."

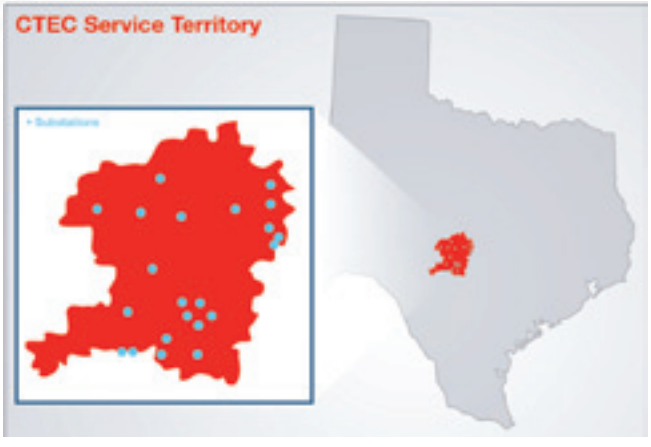
About the author

Tom Wilson, VP and General Manager, Molded Products, has more than 25 years' experience serving the utility industry and 35 years in and around wire and cable. Prior to Hendrix, Tom held positions at Champlain Cable Corporation in which he was responsible for data transmission, aerospace and control cable. Before wire and cable Tom worked at Willson Safety Products where he was involved with the National Institute of Occupational Safety and Health and helped establish the Safety Equipment Institute as a third party quality assurance mechanism for the safety equipment industry. He has worked in various capacities with plastic injection molding for over 15 years. He received his BA from Saint Michael's College in Winooski, VT. He also studied statistics and quality at the University of West Virginia.

Leveraging Low-Cost Cellular to Connect Grid Assets in Texas Hill Country

By Joby Wieser, CTEC and Bryan Seal, Itron

Central Texas Electric Cooperative (CTEC) owns and operates electric distribution services in 11 counties in central Texas, around the cities of Fredericksburg, Mason, and Llano. Its service territory is roughly 4,500 square miles of classic Texas hill country – remote, expansive and pocked by springs, streams, and rivers. The unique rolling topography makes for ideal outdoor activities and a booming draw for retirees. But it also makes it tough to reliably provide network connectivity to isolated and scattered distribution substations, especially during extreme weather events, including thunderstorms, hailstorms and tornadoes – all of which occur with some frequency in the area.



Like all electric utilities, CTEC's distribution substations contain vital data collection and control elements that CTEC needs to communicate with in order to enhance operational awareness and control. And like most other utilities, CTEC has utilized a variety of technologies over the years to get the job done.

The Lay of the Land

In 1994, CTEC enabled communications with some of its distribution substations with its first SCADA system, which used a licensed 2400bps radio network operated in a point-to-multi-point configuration. With a single 2400-baud channel shared among its various substations, the utility could only take advantage of certain SCADA functions. On average, this system would allow data refresh from all substations only every 15 minutes. In recent years, CTEC expanded its SCADA system into other distribution substations utilizing a number of different communications technologies, including phone line (POTS), DSL, radio internet providers (ISPs) and local fiber optic cable.

In 1997, CTEC deployed a one-way communications power line carrier (PLC) automated meter reading (AMR) system, followed later by the deployment of a two-way communications PLC AMR system. Both systems allowed for the retrieval of customer billing and operational data. While the one-way system utilized POTS-based communications to retrieve data from substation receivers, the two-way system allowed Internet Protocol (IP) backhaul from the substation. As with their SCADA system, CTEC utilized a hybrid approach to provide data backhaul communications from the AMR receiver located in their substation to head end software back at their headquarters in Fredericksburg.

Along the way, CTEC found that each of the communications technologies had significant downsides:

- Dial-up, adequate for one-way AMR communications, was leveraged to provide two-way connectivity for the other AMR system by utilizing line sharing and other devices. This arrangement resulted in long distance calls to some of CTEC's substations.
- Digital Subscriber Line (DSL) service involved wired and wireless technologies from different service providers and required frequent troubleshooting.
- Recurring costs often totaled more than $150 per month per substation.

An additional hidden cost directly impacted CTEC personnel and resources. Joby Wieser, CTEC's Technical Services Specialist, estimates that he spent at least one day per week troubleshooting communications infrastructure in the field. Though mostly simple fixes – rebooting, settings, and configuration – his trips to substations would cover long distances, up to 60 miles each way. "A real headache," he noted.

Texas Hill Country

Like other electricity cooperatives, CTEC faced a seemingly untenable dilemma. On one hand, it needed to modernize its connectivity to rural assets. On the other hand, it had a limited budget. Given the long distances between assets in this rural Texas landscape, fiber was too expensive to install to all but one substation near CTEC's headquarters. Similarly, building a microwave solution to cover CTEC's service territory would meet operational goals but was too cost prohibitive. On initial purchase, the solution had to be cost-effective, secure, reliable and have a low recurring cost.

Cost Effectively Connecting the Dots

Under Wieser's leadership, CTEC sought proposals for solutions to, in his words, "provide a more uniform IP communications methodology." As he considered his options, Wieser discovered Itron's cellular grid connectivity solution. As cellular service now covers 98 percent of the U.S. population, CTEC validated that all substations in its territory had solid 3G AT&T cellular coverage except for one – a problem solved by installing an external antenna, which adequately boosted reception.

The Itron solution would give CTEC data connectivity for both the AMR and SCADA systems simultaneously at each substation and the ability to deliver that data to the different head-end data applications back at CTEC's offices. Further, it would incorporate many tools that allow for communications link troubleshooting, such as WAN/LAN IP packet logging and detailed system operations logs. Other tools would constantly monitor the system's state of connectivity, automatically reacquiring a cellular connection if the connection unexpectedly dropped.

Despite the promise of operational advantages, simple questions remained. Would the solution be cost-effective to implement and reliably operate going forward? How quickly could the solution be integrated into existing infrastructure? Would the solution help CTEC overcome the operational inefficiencies that stressed its personnel and resources?

Going Cellular for Connectivity

CTEC piloted the grid connectivity solution in early 2011 and began a full-scale deployment toward the end of that year. In order to move to full deployment, CTEC had to accomplish two key goals:

1. Establish a private AT&T connection between each substation and CTEC's offices
2. Ensure the existing IT architecture within each substation was optimal

CTEC and its IT management company worked directly with AT&T to establish its own private wireless IP segment (called an Access Point Name or APN) with static private IP addresses and a virtual private network (VPN) connection. With the APN and VPN established, CTEC now had a private wireless extension of its IT network available to every substation within its service territory.

The second step was to optimize the IT architecture within each substation using the routing services provided by Iron's cellular router. Routing tables were established to allow each substation device to be connected to the Local Area Network (LAN). Like devices in each substation were assigned the same IP address (10.10.10.xxx) and each substation was differentiated according to the static WAN IP address AT&T assigned to Itron's cellular router. This greatly simplified setup and maintenance. CTEC utilized one of the two available RS232 ports on the cellular router to connect directly with the one-way AMR receiver, allowing it to be disconnected from the substation POTS line. In the end, the solution uses a private segment to send all data – whether IP or serial – from the substation, through AT&T's secure system and to different head end systems located at CTEC's headquarters in Fredericksburg.

Realizing the Benefits

For CTEC, a cellular approach to grid connectivity with AT&T connectivity represents a huge improvement in data collection speeds and efficiency. Now CTEC pulls AMR data as frequently as needed and SCADA polls each protective relay every six seconds — compared with every 15 minutes prior to implementation.

Perhaps the most welcome surprise was the costs associated with implementation and ongoing operations. Based on the previous year's operation and maintenance costs, the new solution would provide CTEC a quick return on investment. In Wieser's words, the solution was "very inexpensive" compared with other prospective solutions and would "pay for itself in one year." All considered, the Itron solution made connectivity simple, secure and affordable.

CTEC Substation

CTEC currently utilizes the solution for all 22 of its substations, reliably backhauling all AMR data. Also, in those substations that had previously utilized a mix of communications technologies for SCADA, all SCADA devices use cellular communications. In full operation since April 2012, the system has operated reliably through all seasons.

The new speed and reliability of communications has enabled two important benefits:

- Data are now coming from substation relays every six seconds, thus providing high situational awareness.
- CTEC can now look for abnormalities and alarms, such as a breaker trips (controlled by the relays) as well as open and close or reprogram breakers. Previously, lag time made these functions slow and unfeasible. Now, in fewer than 10 seconds, operators know that an open or closed command is successful.

The deployment of Itron's grid connectivity solution has allowed CTEC to cost-effectively upgrade its data communications to each substation. The new technology has positively impacted the utility on numerous levels, including improved operational efficiency and reliability, enhanced data collection and SCADA capabilities, as well as significantly reduced ongoing operational and maintenance expenditures. Even after weighing the initial capital and ongoing operational expenses, the solution has effectively paid for itself within one year.

The future is bright for CTEC. The deployment has been so successful that the utility now plans to migrate the remaining SCADA units from the last of the 2400bps radio communications equipment. The addition of high bandwidth cellular communications will allow CTEC to further leverage existing substation assets for improved data exchange and system performance.

About the authors

Joby Wieser has worked for Central Texas Electric Cooperative for 26 years applying new technologies to the operation of the electric system including GIS, SCADA, AMR, Voice and Data Communications, and system planning.

Bryan Seal is a 31-year industry veteran having worked 23 years for The Southern Company in distribution, metering and metering communications. He joined SmartSynch in 2005 to lead SmartSynch's engineering team. In 2012, as part of the Itron acquisition of SmartSynch, Bryan joined Itron. He is currently focused on technology solutions within the North American public power markets.

THE BIGGER PICTURE

BY BERNADETTE CORPUZ AND JOHN VELLONE

Ontario's Feed-in Tariff Program and The LDCs that connect them

The Fitness Director is in Town: Two new directives in two months' time for ONTARIO'S Feed-in Tariff Program

On June 12, 2013, Ontario's Minister of Energy issued a directive to the Ontario Power Authority ("OPA") pursuant to the Electricity Act, 1998 to amend the Feed-in-Tariff ("FIT") program. The directive expands upon the announcements made in a speech by the Ontario Minister of Energy to an energy industry association less than a month prior.

Green revenue opportunities for the Province's public sector

Under the directive, the OPA was tasked with revising the FIT program for renewable projects between 10 and 500 kW ("Small FIT") to give priority to projects partnered or led by municipalities and public sector entities, including publicly funded schools, colleges and universities, hospitals and publicly-owned long-term care facilities, and public transit. These incentives include the provision of a 'price adder' to the standard FIT pricing, the provision of priority points during the application process and the creation of capacity set-asides.

The OPA has also been tasked with addressing two areas which have been particularly problematic from a public sector perspective. Firstly, the OPA will be required to ensure that site access requirements for municipalities and public sector entities are compatible with applicable public sector procurement legislation and directives. Secondly, the OPA will be required to provide municipalities and public sector entities with access to funding for costs associated with design and development of their Small FIT projects. This funding will be similar to the funding that is already available for community co-op and aboriginal sponsored projects.

These announcements and directives clearly signal Ontario's strong commitment to small renewable energy projects by making a total of 900 MW of new capacity available between now and 2018 for the Small FIT and microFIT (10 kW and under) programs. The OPA will open a new procurement window for Small FIT and microFIT starting in the fall of 2013. The fall 2013 procurement target will be 70 MW for Small FIT and 30 MW for microFIT, with annual procurement targets being set thereafter at 150 MW for Small FIT and 50 MW for microFIT. The OPA will also be launching a pilot program for rooftop solar projects on unconstructed buildings during the new procurement window for Small FIT.

Testing Fitness – Large FIT Players to Compete

The Minister also directed the OPA to develop a competitive procurement process for renewable energy projects over 500 kW, which will replace the existing large project stream of the FIT program. Under the new competitive procurement process, the OPA will be required to engage with municipalities to help identify appropriate locations and siting requirements for future large renewable energy projects. The Government has also asked the Independent Electricity System Operator and the OPA to consult on the development of regional energy plans to ensure that the right siting decisions are made the first time. The OPA will be providing the Minister with interim recommendations by September 1, and will continue consultations throughout the fall of 2013.

The Playing Field is still Global

By now the global renewable sector has seen the rulings adopted by the World Trade Organization over the challenges made to Ontario's Feed-in Tariff program. The Ontario Government intends to amend the FIT Program for compliance with these rulings. While the Province works towards a full implementation plan for compliance, the Government has directed an interim plan. On August 16, 2013, the Minister of Energy issued a directive to the OPA to reduce the domestic content requirements for new FIT procurement. The directive provides that new FIT contracts will require facilities to achieve the following minimum domestic content:

- For on-shore wind facilities, the minimum domestic content level shall be 20 percent.
- For solar photovoltaic, (PV) facilities utilizing crystalline silicon PV technology, the minimum domestic content levels shall be 22 percent.
- For solar photovoltaic, (PV) facilities utilizing thin-film PV technology, the minimum required domestic content level shall be 28 percent.
- For solar photovoltaic, (PV) facilities utilizing concentrated PV technology the minimum required domestic content level shall be 19 percent.

These required levels will be in effect until the Minister issues another directive to the OPA for final implementation requirements in relation to the WTO rulings.

LDC Business Enhancements

Folks not intimately familiar with local distribution in Ontario are often surprised to discover there are almost 80 electricity distributors (local distribution companies, or LDCs) in the Province. The audible gasp often reflects disbelief that such a high number cannot possibly be an efficient model for the sector. Indeed, the sector has been the subject of significant study in the Province over the past few years. Substantial reviews have reached similar conclusions that regional consolidation of LDCs would provide beneficial synergies and cost savings to Ontario's electricity consumers. But despite the number of industry experts recommending consolidation, it is by no means an uncontroversial issue rooted in the duelling argument that what is good for the sector may not be good for a particular LDC.

Other voices have suggested that there are other ways to obtain the cost savings and synergies, was that are more appropriately tailored to a specific LDC. Expanded business or revenue opportunities are bandied about, such as the multi-utility model that includes water services and amendments to regulatory decisions to enable LDCs to perform street lighting. LDCs in Ontario are statutorily required to engage only in approved businesses so the typical strategic thinking on seeking out business opportunities is inherently dampened. The challenge, of course, is that the demands placed on LDCs continue to increase, whether rooted in pressures to replace aging infrastructure and enhance infrastructure to accommodate renewables.

As a result, a recent proposal made by the Ministry of Energy is a hopeful source of new revenue for LDCs.

Expanded revenue

On July 2, 2013, the Ministry of Energy posted a proposal to the Environmental Registry to amend Ontario Regulation 161/99 to allow distributors to provide street lighting and sentinel lighting services, maintenance, and repairs (EBR Registry Number: 011-9501).

The proposal was posted for a 45 day public review and comment period starting July 2, 2013. Interested parties had until August 16, 2013, to submit comments.

The Ministry of Energy describes the purpose of the proposal as follows:

"Section 71 of the Ontario Energy Board Act (OEBA) 1998 currently restricts licensed electricity distributors from directly undertaking most business activities, including activities related to street lighting and sentinel lighting, a legacy of the 1998 electricity sector restructuring that encouraged competition.

Section 71 of the OEBA originally intended that competitive work, such as street lighting, be done by an LDC affiliate or independent third party. As such, LDCs are restricted to undertaking distribution activities such as repairing lines and poles. This original policy intent is reflected in Section 71(1) of the OEBA which prohibits an electricity distributor from carrying on any business activity other than distributing electricity, except through one or more affiliates.

However, over the past decade, the policy landscape has evolved. Electricity distributors have been allowed to expand their business into competitive conservation and renewable generation activities.

For instance, as part of OEBA amendments in 2004, Section 71(2) was added which allowed electricity distributors to provide services related to the promotion of electricity conservation and the efficient use of electricity. This included energy efficiency improvements to street lighting. In practical terms, this amendment meant that electricity distributors could provide street lighting and sentinel lighting services, maintenance or repairs themselves (rather than through affiliates) to improve energy efficiency (e.g. install new efficient bulb), but not for other purposes (e.g. replace existing bulb).

The current approach to providing street lighting and sentinel lighting services, repairs, and maintenance lacks regulatory consistency and is overly restrictive. It permits LDCs to replace incandescent bulbs with more energy efficient bulbs. However, LDCs are not allowed to replace a broken bulb with another identical bulb because that would not be considered 'distributing' electricity or promoting electricity conservation or efficient electricity use.

This approach also limits choices for owners of street lighting and sentinel lighting assets, particularly those in some smaller towns and rural communities in Northern Ontario where there is a lack of competitive alternatives to the local LDC.

In order to allow the full-servicing of street lighting and sentinel lighting, the Ministry of Energy is proposing to amend Ontario Regulation 161/99. This regulation prescribes exemptions from various sections of the OEBA. The proposed amendment would exempt licensed electricity distributors from section 71(1) of the OEBA, with respect to providing street lighting and sentinel lighting services, maintenance or repairs in their licensed distribution territory.

Both LDC affiliates and independent third party contractors would still be able to bid for and undertake this work. It would also not affect the flexibility and choice of municipalities to directly undertake this work.

This proposed amendment would expand the scope of business activities that LDCs could undertake. This is consistent with recent amendments giving LDCs the authority to provide services that promote energy conservation and efficiency without using an affiliate.

However, LDCs would be restricted to providing these services in their own service territory (defined in their OEB licence), and at the fully allocated cost, to ensure a fair competitive tendering process and protect ratepayers from any potential cross-subsidization of municipal shareholders or taxpayers."

The proposal is viewed by the LDC sector as a win – a win to conduct business activities that LDCs have long argued are a natural extension of their assets.

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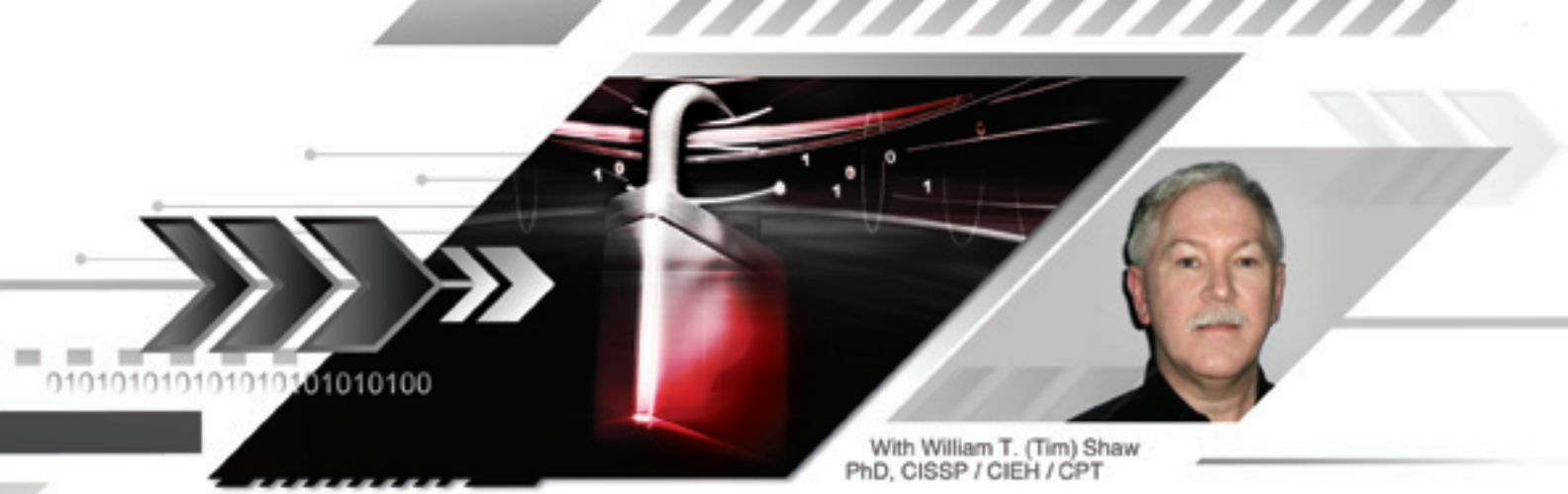
John Vellone is an associate in the Electricity Markets and IT Groups of the law firm Borden Ladner Gervais LLP (BLG). John practises corporate/commercial and regulatory law with a focus on energy law and matters relating to the Ontario electricity sector and specializes in the corporate/commercial and regulatory components of electricity markets and infrastructure revitalization. John can be reached at jvellone@blg.com or 416-367-6730.



SECURITY SESSIONS

The Russians are Coming!
(and so are their friends)

Have you heard the one about the Chinese hackers that attacked the honeypot that was designed to look like a municipal water utility control system and got caught in the act? Sorry, that's not actually the start of a joke, it is an actual fact, and not one that ought to make you laugh. In the last few years cyber security researchers, corporate IT organizations, and government agencies have identified a huge number of illegal entries into corporate systems, networks and computers by highly skilled hackers believed to be part of a Chinese military operation. If you don't take cyber security seriously your systems and networks could be next.

I believe that I am not an alarmist (others may differ in their opinions) and I like to see the facts before I go off on a rant. But the evidence of widespread cyber meddling by foreign nation states, activist groups, and terrorist groups is growing every day and hardly a week goes by where we don't hear about yet another hacking attempt or hacking success that was eventually discovered to the amazement of all involved. Some of this activity is even being perpetrated against high-tech companies and companies who are in the business of cyber security and who you would expect to be secure.

In my opening paragraph I mentioned a 'honeypot' and maybe I should explain. Since remotely attacking a computer system mainly involves sending specially crafted messages and examining the responses it is possible to create a simulation of a real system that responds in the way the actual system would, leading the attackers to believe that they are attacking the real deal. A well designed honeypot can fool even expert hackers up to a point; hopefully long enough to gather information about how the attackers are trying to exploit the simulation and even who they are. Researchers, government laboratories such as Idaho National Labs, and other organizations, have staged numerous honeypots designed to look like commercial industrial automation systems in an effort to collect information on attack methods and attack sources. The higher-fidelity honeypots even incorporate cyber security mechanisms to make them look more realistic and to fend off the amateurs while presenting a tempting target to the serious threat agents.

It is pretty well documented that the Chinese government (via their military) and other governments with a bone to pick with the USA (such as Russia), along with international terrorist groups in the Middle East have developed cyber warfare teams and have them busily probing our defenses. But the focus of these efforts is only partially on our government organizations and military. A growing majority of them are aimed at our critical infrastructure and associated computer-based automation systems (particularly DCS and SCADA systems). Terrorist groups would like to take control of critical automation systems and networks in order to generate a newsworthy 'incident', preferably with as much murder and mayhem as is possible – which is what terrorism is all about after all. The nation states tend to want to gather (steal) technology and intellectual property and to establish backdoors into critical systems so that if they needed to create a problem for us some day (or just threaten us with one) they would have the ability to do so. Imagine if we threatened to block a Chinese invasion of Taiwan and they threatened to take down our power grid and the water supplies of all major cities if we interfered. I wouldn't like to be the one making that call. I prefer to be one of those making sure that such unpalatable contingencies never arise.

You may be wondering if we have comparable or even superior military cyber capabilities and, if so, why don't we use them to take out the perpetrators? Why can't the government make the problem go away? Why not just disconnect evil countries from the Internet? Well, I don't have time for a civics lesson here, or a lengthy discussion of international law, but at least you need to understand that even though we may have invented the Internet we don't own it and we don't control all of it. We may well have branches of the military and other government agencies with significant cyber expertise, but they are constrained by our own laws and international treaties.

Many people would probably be thinking "but we have had years to get protections in place so why is this still happening? Have the hackers developed super-human powers??" The sad fact is that even though there have been government warnings about the need for cyber security far too many organizations just ignored the warnings and hoped for the best. After all wouldn't Microsoft eventually send out some security patches and make all of these problems go away? Can't Cisco sell us a magic box that will keep the bad guys at bay? Other organizations just played the probabilistic risk assessment game and proved (to themselves at least) that the actual risk was so small that they could not make a business case to justify putting any effort or funding into cyber protections. Yet still other organizations asked the simple question: "what is the minimal effort I can expend to prove to regulators and underwriters that we have addressed cyber security?" and then used the answers to that pondering as the basis for their cyber security efforts.

I am not saying that everyone and every organization are guilty of these evasions, but far too many are. I have been in plants recently where they are still arguing about isolating the plant network from the corporate networks, because that makes it hard (or impossible) for corporate IT to remotely administer things at the plant site. Hackers love it when you keep weak and persistent remote access mechanisms in place. What makes it convenient for corporate IT also makes it easier for hackers. Some of the facilities I have been in recently still permit remote dial-in access to control systems. There are even plants where people still carry around USB 'thumb drives' and plug them into any system or device they want, with no concern about what they may contain or where they have been. We know better, but for whatever reasons we don't implement the measures that this knowledge dictates taking.

America and Americans have always had a problem with getting our act together before the disaster hits. We are the world's best at rushing in to rescue, recover, and restore after disaster strikes, but amazingly bad at up-front preparedness. We seem to believe that "it won't happen here" and don't prepare. Then we get smacked in the face by floods, hurricanes, droughts, and yes, cyber attacks. Far too many of our industrial automation systems are still far too vulnerable to cyber attack and infiltration simply because nothing much has been done to protect them. The surprising facts about successful cyber attacks are that a substantial number of them are based on exploiting vulnerabilities that we already know how to fix.

One of the reasons that we are in this fix is that corporations have grown information hungry and demand real-time data from around the enterprise in order to feed business optimization models. Plant automation systems used to be isolated and data required by corporate applications was delivered on magnetic tape or floppy disks. Today, too many plant automation networks are directly connected to a corporate network with minimal protections between the two. The ISA's SP.99 committee and NIST came together several years back to issue SP 800-82 which provides guidance on separating plant and corporate networks using a 'DMZ' approach. The problem is that this strategy isolates corporate IT from reaching into plant systems and networks which means that plants need more local IT support. I recently saw a plant where the DMZ contained a dozen different servers, with the only reason for their being positioned in the DMZ was so that corporate IT could administer them. Placing a bunch of inadequately hardened servers in the DMZ totally defeats the purpose of having a DMZ. It's like placing a bunch of bridges over a river and only guarding some of them and then wondering how unauthorized people are getting across.

Time and time again I see cost avoidance or reduction being used to justify minimal or poor cyber security. At least up to the point where a corporation is subjected to a successful cyber attack, and then the check books come out. I am reminded of visiting a plant and talking to the I&C engineer who was given the task of putting some cyber security in place, but not provided with time and funding to get any specialized training. He proudly showed me the firewall that he had placed between the corporate network and the plant network. When I asked him about the access control rules he told me "only I have access to this firewall." So I tried again and asked about the security policies and he told me "our policy is that only I can support the firewall." On my third try I asked if he had programmed any settings and configuration into the firewall and he told me that "it came out of the box already programmed." He then added that when he put it in place everything kept working so he didn't think he should change anything in the configuration. We dumped the ACL rule list and as I feared there were only two factory default rules, one for in-coming messages and one for out-going messages: 'Permit All.' Essentially the firewall was a wire, but the poor engineer didn't have the training to know that he had no protections in place. Up to that point he had been sure that his plant was protected because he had installed a firewall. Now that's a real joke.

Come on people, we can do better than this! But that will have to be the subject matter for a future column.

ABOUT THE AUTHOR

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Scott Zajkowski

BYOD* and Mobile Data Security in a Regulated Industry

Guest Editorial >

By Hormazd Romer, Senior Director of Product Marketing

Companies in the energy industry have a wide range of regulatory laws that they must comply with, from critical infrastructure issues to how raw materials are bid upon in the public sector. Often security is an afterthought when it comes to organizational data, but with increases in cyber-attacks and data leakage it's an area that the energy industry cannot afford to ignore. Data security is one of the regulations covered by NERC's Critical Infrastructure Protection (CIP) plan, and it's a growing area of concern as more digital data is shared between employees, vendors, and external utilities via a wide range of devices.

Before we discuss best practices for safe data sharing, we must assess the risks that energy companies need to consider when implementing security policies and technology, especially with the growing use of mobile devices in all organizations. There are a number of risks that can affect the security of an energy-based organization, such as:

- **Data Contamination:** Today, an employee's vacation photos are likely to reside on the same devices that they use for work. The photos, and other content, share storage space along with confidential business data. Never before has personal data mixed so freely and casually with business information. This combining of data introduces new risks to the enterprise. Through carelessly configured back-ups or file copies, personal content might accidentally end up on corporate file servers. Worse, personal files that contain malware might spread to business files and from a mobile device to internal file servers and other enterprise assets.

- **New Forms of Malware:** IBM predicts that mobile malware will grow 15 percent annually for the next few years. Hackers and criminal syndicates realize that most mobile devices are less secure than more traditional devices like laptops. They have begun targeting mobile devices for attacks ranging from mischievous pranks to advanced persistent threats that stealthily copy internal data over many months, transmitting it to remote control centers around the world.

- **Lost Devices:** On average, a cell phone is lost in the U.S. every 3.5 seconds. Even if a lost smartphone or tablet does not contain confidential data, it still might include apps or cached credentials that make it easier for criminals to infiltrate an enterprise network. As workers begin carrying more devices, the likelihood of them being lost increases, as does an organization's level of risk.

- **Risky File Sharing:** A device without data is of limited use. To ensure all of their devices have the files they need, employees often try out one or more file-sharing services, including free but risky file-sharing services that run on public clouds. Unfortunately, these services, though popular, are usually not secure enough to be trusted with enterprise data. In one instance, the popular service Dropbox accidentally disabled all password protection on all its customers' accounts for four hours last year. Having originally been designed for consumers, these services lack the centralized control and monitoring features that large utility enterprises and government agencies need for security and compliance.

  In addition, many public cloud file-sharing services also pose legal risks to a company's claim to own and control its data. For example, the terms of use for Google Drive, Google's free file-sharing service, begin by stating that users retain the intellectual copyright for the ideas in the content they store. But the terms go on to say that by using the service, customers grant Google and its partners the right to reproduce and modify any uploaded data in order to operate, promote, or improve Google services. Understandably, most enterprises would be reluctant to surrender control of their data to Google under such sweeping terms simply for the convenience of free file sharing and collaboration.

It's necessary that energy-based organizations demand a high level of security to help protect their proprietary content, no matter what device employees are using when they share data and collaborate. However, to make the most of these solutions, it's important for security teams to focus their attention on the actual content that is being utilized by their organization.

Mobile Content Management (MCM) is a new class of mobile security solution that focuses on securing content, whether it's located on a mobile phone or behind the firewall of an organization's network. To protect content stored on, or being shared to and from mobile devices, MCM solutions provide secure software 'containers.' These containers shield confidential data from unauthorized access and malware infection. Even if other files on the device do become infected with malware, the files within the container remain safe. IT departments can configure and control these secure containers remotely, so if a device is lost or stolen, administrators can quickly disable access rights for all files in that container on the device. Finally, all data shared, synced or edited by an employee will reside in the secure container, rather than on a public-cloud or the hard drive of the actual device.

BYOD* and Mobile Data Security in a Regulated Industry

When leveraging a secure mobile file sharing solution, here are six best practices for organization that are working to protect confidential data:

- **Best Practice #1: Choose a Solution that Protects All Confidential Files.** Organizations should select a solution that works with whatever mobile devices employees are carrying and whatever other networks those devices are connecting with, so that no set of data is unprotected.

- **Best Practice #2: Centralize Access Control and Monitoring.** Centralized monitoring allows network administrators and security officers to monitor the distribution of files and to detect anomalous behavior before it leads to data breaches. Centralized monitoring and logging are essential capabilities for organizations that need to comply with industry IT regulations such as Sarbanes-Oxley (SOX).

  To comply with SOX, for example, public companies in the U.S. must be able to demonstrate that they can audit and control the distribution of all files containing proprietary financial information. If files are distributed over a public-cloud service like Dropbox, the IT and security teams will lack any way to monitor the distribution of files. On the contrary, confidential data could be easily replicated or distributed broadly, and the organization would never know until the data breach was exposed, probably resulting in regulatory censure and other penalties.

- **Best Practice #3: Integrate with Existing Content Management Systems.** Many organizations have invested in enterprise content management (ECM) systems like SharePoint. These systems provide advanced role-based controls for file storage and powerful search capabilities to help employees find information quickly. Unfortunately, accessing these systems remotely can be cumbersome or downright impossible, depending on the configuration of the mobile devices and the ECM system. When access proves difficult, employees sometimes begin keeping local copies of files and copying them from device to device, thereby undermining the security and version-control features of the ECM system. Organizations should select a solution that provides access to content stored in these existing systems. This way secure mobile file sharing is a reality for workers in remote locations, and they always have access to the critical files they need.

- **Best Practice #4: Increase Trust and Control with Private Clouds.** Private cloud solutions – cloud services that enterprises run in internal data centers – can provide the scalability and cost-effectiveness of cloud computing without the security and availability risks of public clouds. Whenever possible, energy organizations should deploy their secure file sharing solutions on private clouds, giving their own IT organizations complete control over the location and availability of data.

- **Best Practice #5: Block Risky Services – Nudge Users to Safety.** Even with an enterprise file-sharing solution in place, employees may be tempted to try the free, consumer-grade services that their friends are using. By blocking these services, enterprises can ensure that mobile workers don't jeopardize the confidentiality and integrity of the confidential data. Educating users about the risks of these public-cloud services is another important way to 'nudge' them into following best practices for data security.

- **Best Practice #6: Choose Solutions Proven to Meet Stringent Third-party Security Requirements.** Organizations should select a solution that has been certified to meet stringent security requirements, such as the NERC CIP requirements that affect all entities that 'materially impact' the bulk power system in the U.S.

  The NERC CIP is focused on management of all cyber assets (IT infrastructure) – the systems that support the operation of the bulk electric system. Because much of the infrastructure supporting the bulk electric power system is IP-based, the NERC CIP standards provide guidelines for the identification and management of critical cyber assets, as well as the security (both physical and cyber) of those assets. And, while many of the disaster scenarios facing the electric grid concern natural disasters like hurricanes or floods, the increased attention on cyber-attacks of utilities around the world has raised the specter of terrorist- or state-sponsored attacks on the electric grid.

By following these best practices, energy organizations can enjoy the benefits of the BYOD revolution – increased productivity and collaboration – while avoiding the security risks. Being a forward-thinking organization can ensure that the company and employees are benefitting from technological advancements, without introducing unnecessary risk to its critical infrastructure and proprietary data. A rigorously secure mobile file sharing solution that supports a broad range of platforms gives network administrators and security teams the controls and monitoring features they need to protect proprietary information.

*Bring Your Own Device

ABOUT THE AUTHOR

Hormazd Romer is the senior director of product marketing at Accellion where he drives product positioning, product messaging, and thought leadership. He brings over 12 years' experience driving product marketing management for enterprise software solutions spanning enterprise security including Web security, identity management, cloud, and virtualization security. Prior to Accellion, Romer was the director of product marketing at Symantec. He graduated from the University of Waterloo.

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