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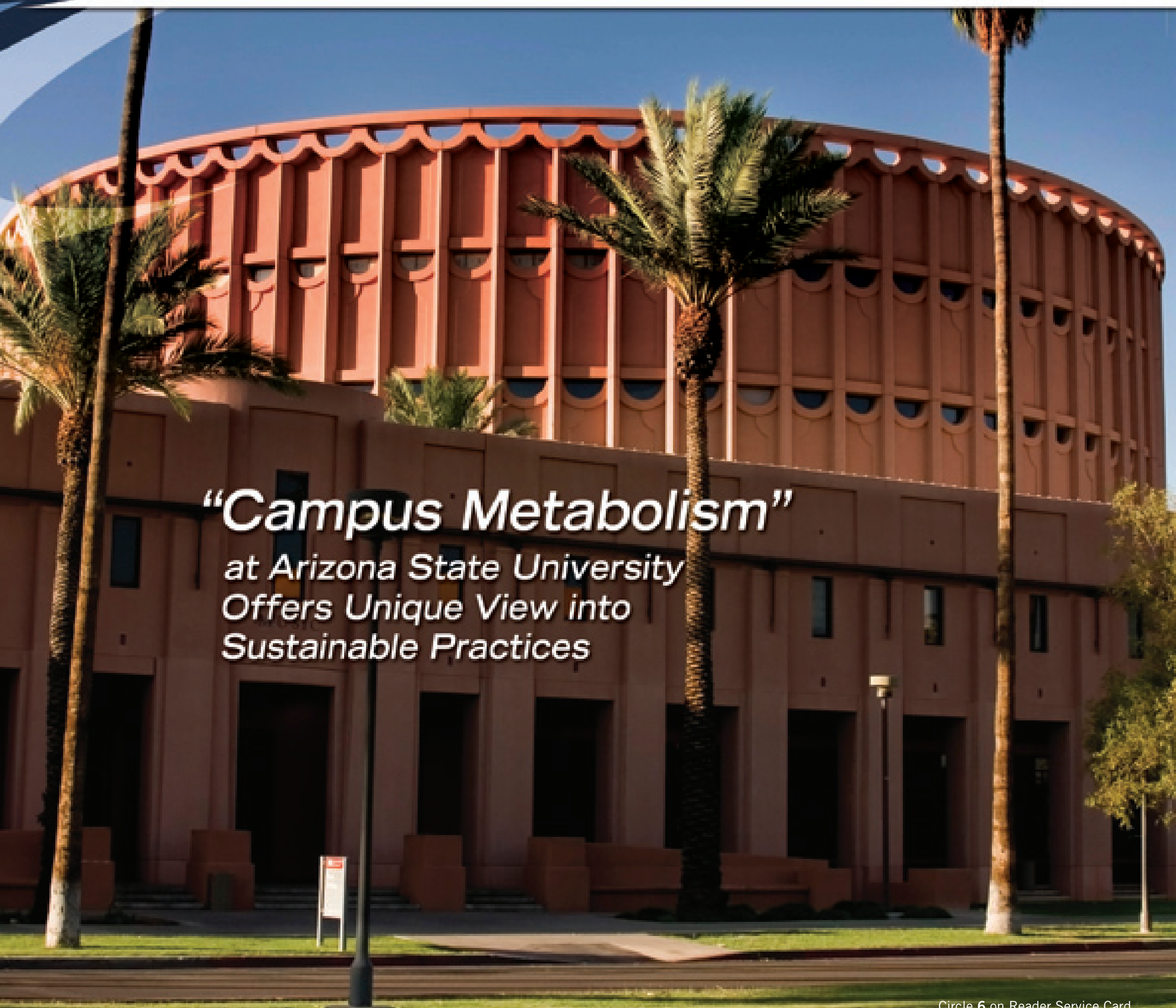

"Campus Metabolism" at Arizona State University Offers Unique View into Sustainable Practices


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Electric Energy T&D is proud to be a member of these associations

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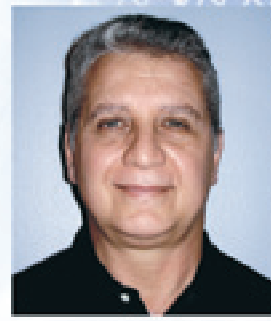
GridLines

Michael A. Marullo, Editor in chief



Proud to be an Amer-I-CAN!

[This isn't a political forum, and I don't intend to turn this column into a political rant, but there are some things that need to be said... and I'm going to say them. It is my hope and intention that by airing these opinions, you will take note that we have some bitter pills to swallow and that making those pills even more bitter than they already are merely exacerbates the problems we're currently facing. I've always believed that discourse – both personal and political – is healthy, so I hope you will read on with an open mind – ED.]

Like a lot of Americans, I'm pretty well fed up with the political situation in this country, which has recently devolved into a morass of partisan infighting while the public is collectively thrown under the bus. With the lowest approval rating in history, the US Congress has achieved virtually nothing in the past two years – other than bringing a once great nation to its knees. The current 'no-holds-barred' mentality flies in the face of the 'give-a-little, get-a-little, get-along' model that the founding fathers of our democracy intended, and which has served us well for over two centuries.

Let's face it; we've had a great ride! Most people in this country in the 'over-50' age group have lived their entire lives believing that anything is possible and that as Americans, we are somehow entitled to always be the biggest and the best in everything we do. Moreover, until recently we had been living the in the longest period of sustained economic growth in the history of the world. All things considered, that's a tough act to follow, to say the least. But now, all of that seems to be unraveling and coming unglued, and understandably, we don't much like that. However, we now have to face some cold, hard facts.

First, Baby Boomers comprise the largest single age group in American society, the effects of which have been profound. For over a half-century, this group has been directly or indirectly responsible for virtually every major social, political, technological – and perhaps most notably – economic accomplishment, extensively fueled by its sheer size and other unique characteristics.

According to a November 21, 2008 article in (the now deceased) *U.S. News & World Report*:

"Baby boomers may not feel rich right now, but they're still the wealthiest generation in U.S. history. Boomers have collectively earned $3.7 trillion, more than twice as much as the $1.6 trillion that members of the silent generation did at the same age, according to a new McKinsey Global Institute report. The researchers found that only 20 percent of that difference was due to economic growth. A whopping 80 percent of the increased earnings were due to three factors specific to the baby boomer generation: Size [79 million people born between 1945 and 1964]; Social Change [Female baby boomers streamed into the workplace at higher rates than their parents did. They also married and had children later and divorced and remained single at higher rates. That means there were more wage earners relative to the total population]; and Education [The boomers' higher level of education than previous generations allowed them to better capitalize on economic changes like productivity growth, technological innovation, and globalization]."

Secondly, our world has changed. No, that's not a profound statement since the world and everything in it is always changing, but I think there's a legitimate argument that the most recent changes are different. Let me illustrate that point with what I consider to be a cogent example of how the fulcrum of the economy has shifted, dramatically and irreversibly.

We frequently use the term "Global Economy" in our daily discussions, and even people not directly involved in international commerce know what that means – or do they? It's one thing to talk about a global economy in terms of where a particular product is manufactured or assembled, but how many really understand the underlying implications of a truly global economy? Consider this...

By now almost everyone knows that Apple Computer recently eclipsed Exxon-Mobil as the world's most valuable company. But this is much more than just a stock market fact. Notably, the world's largest 'energy' company has been knocked off its lofty perch by an 'information' company. (Please, spare me the technicalities around the definition 'energy' versus 'information' as this is for illustrative purposes only.) So what does that mean?

Well, for one thing it means that the type of company at the top of the totem pole is no longer in that position largely because it supports a substantially labor-intensive work force of its own, plus the massive automotive industry – which in turn, has created and supported thousands upon thousands of manufacturing jobs over the past 100 years.

Part of the bitter pill I mentioned at the outset is that the vast majority of those manufacturing jobs are simply not coming back – ever – and we need to stop telling ourselves that they are. What we are seeing in America, along with much if the developed world, is a sort of reverse Industrial Revolution. And as hard as it is to accept, it means that no matter how much we trim wages and worker benefits or reduce material costs and overhead, optimize transportation, etc. there is no way we can compete with labor that earns a small fraction of our wage scale with essentially no benefits or regulatory burdens.

By contrast, an information-centric industrial sector not only doesn't need a manufacturing mindset, it calls for an entirely different kind of work force. Again, this is clearly not the message that millions of jobless people want to hear or that political pundits will find easy to pin on any one political party or individual, but it has to be dealt with in a meaningful and pro-active way. Pointing fingers, placing blame and denouncing measures designed to move forward – as opposed to politically-correct attempts to return to the status quo – are never going to dig us out of the hole we're in.

Blame it on whomever you want (politically), but this shift really has very little to do with politics. Bottom line, this IS the new world order, so get used to it. Americans used to thrive on this kind of challenge. Let's stop waiting for the past to return. Instead, let's re-think and re-invent our future and get back to the can-do attitude that made America great. Or, as the bumper sticker says: *Proud to be an Amer-I-CAN!* – ***Ed***.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INDUSTRY NEWS

Coalition for Fair Transmission Policy Urges Congress to Review Deficiencies in FERC Order 1000

"Transmission Planning Must Be Driven By Measurable Benefits to Costumers at Lowest Reasonable Cost"

Washington, October, 2011 - The Coalition for Fair Transmission Policy (CFTP) told the House Subcommittee on Energy and Power that costs of new transmission projects driven by economic needs or public policy requirements must be allocated to customers in a manner proportional to the measurable benefits that customers receive from those projects.

"We thank the Committee for holding this hearing and their timely consideration of the broad implications of FERC's Order 1000 for the reliability and economics of our nation's electric systems," said Steve Transeth, representing the Coalition and principal partner at Transeth and Associates. "Order 1000 is deficient not so much for what it says, but more for what it doesn't say."

In his testimony, Transeth raised important concerns and questions regarding the Order, in particular: the definition of "benefits," potential conflicts between required regional planning processes and local policies, and questions regarding the boundaries for the legal authority to implement the proposed changes.

The hearing focused on topics related to siting, planning, and allocation of costs for electricity transmission infrastructure as part of the Federal Energy Regulatory Commission's (FERC) Order 1000. In addition to CFTP, the subcommittee heard testimony from two panels of witnesses, including FERC Chairman Jon Wellinghoff, Lauren Azar, Senior Advisor to the U.S. Secretary of Energy, state commissioners from Michigan and Washington, utilities, and regional transmission organizations. Steve Transeth, a principal partner at a Michigan-based law firm specializing in energy issues, addressed subcommittee hearing on electric transmission.

The Order's lack of guidance to regions as to how benefits should be defined, "will leave open the very real possibility that regions can adopt extremely broad definitions that result in unfounded conclusions that everyone benefits from new transmission and all should pay - thus socializing all transmission costs within a region - resulting in higher costs to customers who will subsidize large remote renewable projects and merchant transmission developers."

"The Coalition believes that transmission planning must be initiated at the local utility and state level, in a bottom-up manner, based on and driven by the needs of customers who bear the burden and received the benefits of new transmission," he continued.

As to how the Order can and will be implemented, particularly outside of areas served by regional transmission organizations, Transeth called attention to more than 60 rehearing petitions filed in response to the Order and stated "there are numerous questions and concerns remaining as to the boundaries of the Commission's legal authorities."

The Coalition has 7 members, including CMS Energy Corporation, ConEdison, DTE Energy, Progress Energy, Public Service Enterprise Group, SCANA Corporation, and Southern Company. More than 28 percent of U.S. electric customers, representing 26 states, are served by utilities and companies which are either formal members of the Coalition or are on record supporting the group's goals.

For more information, please visit the Coalition's website at: www.fairtransmission.org

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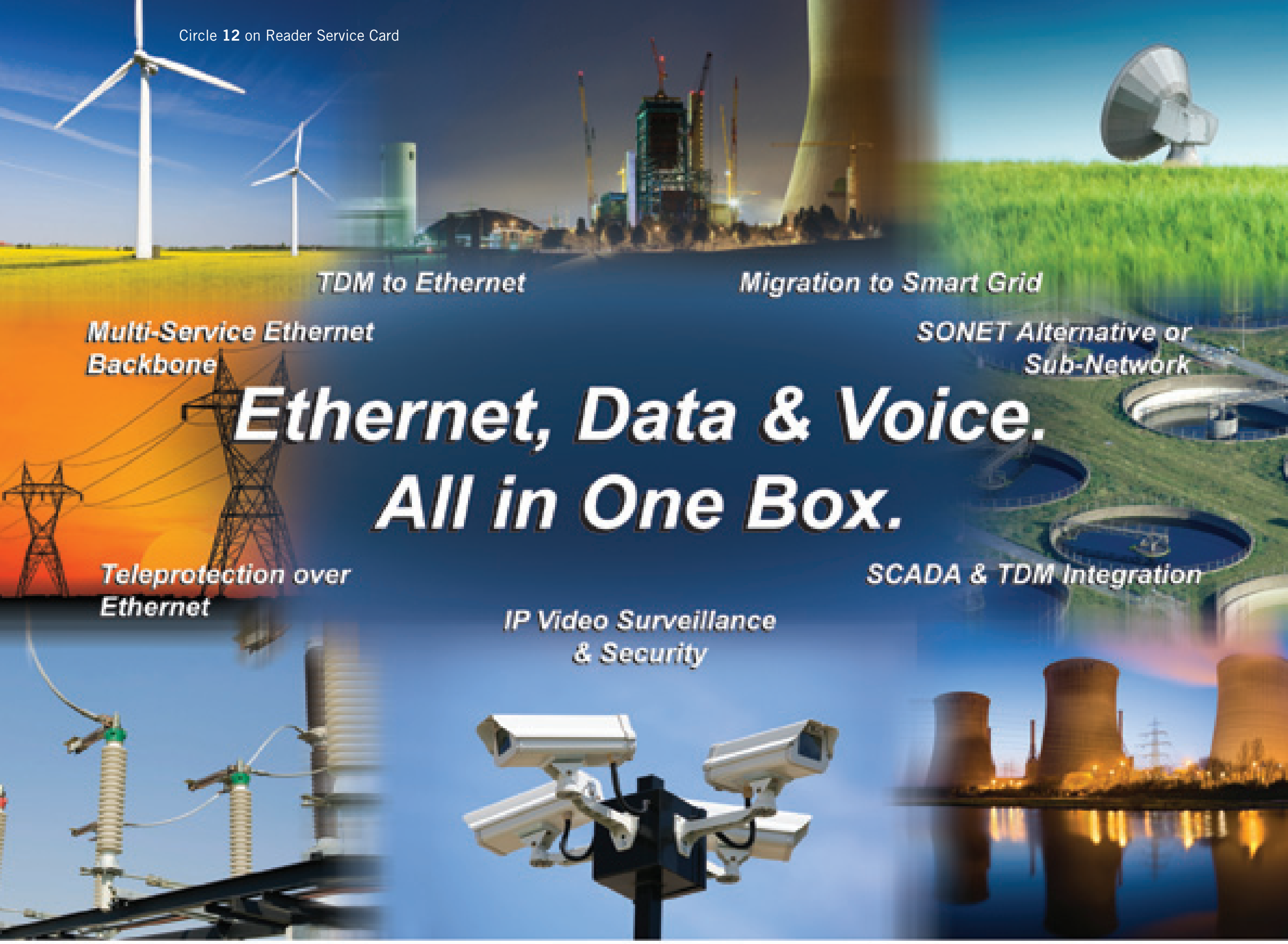
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INDUSTRY NEWS

Seven Auto Manufacturers Collaborate on Harmonized Electric Vehicle Fast Charging Solution

Dearborn, MI, October, 2011 -

- Audi, BMW, Daimler, Ford, General Motors, Porsche and Volkswagen agreed to support a harmonized single-port fast charging approach for use on electric vehicles in Europe and the United States
- The system is a combined charging approach that integrates all charging scenarios into one vehicle inlet/charging connector and uses identical ways for the vehicle to communicate with the charging station
- The seven auto manufacturers also agreed to use HomePlug GreenPHY as the communication protocol. This approach will facilitate integration of the electric vehicle into future smart grid applications
- Agreeing upon a single, harmonized DC fast charging system, we believe will help infrastructure planning, reduce vehicle complexity and improve the ownership experience for electric vehicle customers

Recognizing the importance of a single international approach for DC fast charging, Audi, BMW, Daimler, Ford, General Motors, Porsche and Volkswagen have agreed on the combined charging system as an international standardized approach to charge electric vehicles (EV) in Europe and the United States.

The system is a combined charging approach integrating all charging scenarios into one vehicle inlet/charging connector and uses identical ways for the vehicle to communicate with the charging station. This allows electric vehicles from Audi, BMW, Daimler, Ford, General Motors, Porsche and Volkswagen can share the same fast charging stations.

The seven auto manufacturers believe the development of a common charging approach is good for customers, the industry and charging infrastructure providers. Standardization will reduce build complexity for manufacturers, accelerate the installation of common systems internationally and most importantly, improve the ownership experience for EV drivers.

The endorsement of the combined charging system was based on reviews and analysis of existing charging strategies, the ergonomics of the connector and the preferences of customers in both the United States and Europe. The harmonized approach – across both continents and all manufacturers - will provide a framework for future infrastructure planning as well as a communication protocol to assist in the integration of electric vehicles into the smart grids.

The seven auto manufacturers also agreed to use HomePlug GreenPHY as the communication protocol. This approach will also facilitate integration of the electric vehicle into future smart grid applications.

Automakers point to the success of Level 1 and Level 2 (for 220V charging in the U.S.) as an example of how standardization will increase the adoption of electric vehicles and increase customer satisfaction. The harmonized electric vehicle charging solution is backward compatible with the J1772 connector standard in the U.S. Backward compatibility also has been achieved in Europe where the system is based on the IEC 62196 Type 2. The approval of the J1772 standard has given electric vehicle owners the comfort of knowing they can charge at all Level 2 charging stations. Prior to standardization an EV owner had no way of knowing if the charge port they were pulling up to was compatible with their vehicle.

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INDUSTRY NEWS

Mexico Smart Grid Market to Reach $8.3 Billion by 2020

Washington, October, 2011 - Northeast Group, LLC released its Mexico Smart Grid Market Forecast (2011-2020) which projects the total smart grid market will reach a cumulative $8.3 billion by 2020. Mexico trails only Brazil in terms of potential for smart grid in the Latin America region. The smart metering market in Mexico represents the biggest opportunity, with more than 21 million smart meters to be deployed by the end of the decade. Other smart grid market segments such as distribution automation, wide area measurement, and home energy management are also projected to grow strongly over the forecast period.

"Mexico is well positioned to develop into a leading smart grid market, both in the Latin America region and globally. Like other Latin American and emerging market nations, the country faces high rates of electricity theft and power outages, both of which can be reduced through smart grid technologies. Mexico is also uniquely situated to benefit from positive spillovers from the US market.These include smart grid standards, US vendors looking for new markets and a transfer of smart grid technical know-how," according to Northeast Group, LLC.

Northeast Group, LLC continues, "Mexico will also benefit from a single, state-owned utility that ensures a streamlined regulatory framework and efficient deployment. Much like ENEL's pioneering smart meter deployment in Italy, CFE (Mexico's sole distribution utility) can ensure that smart grid deployments are quickly rolled out to all parts of the country."

Mexico's smart meter market alone will contribute $5.1 billion to the overall smart grid market value by 2020. This includes meter hardware, communications, IT, installation costs and professional services.Combined with Northeast Group, LLC's South America forecast (released June 2011), the total Latin American smart metering market is expected to reach nearly 126 million meters by 2020.

In addition to smart meter deployments, Mexico is projected to invest heavily in distribution automation, wide area measurement and home energy management in the later half of the decade. These other segments of the smart grid market make up an additional $3.2 billion in cumulative market opportunity by 2020.

Northeast Group, LLC's report forecasts 14 different segments of the Mexican smart grid market. These include market values for smart metering segments (hardware, communications, IT, installation and professional services), distribution automation (substation automation, FDIR, volt/VAR optimization and grid monitoring), wide area measurement, home energy management (home area networks, smart solar inverters, and electric vehicle supply equipment) and an electric vehicle penetration forecast. In addition to market forecasts, the report highlights domestic Mexican firms poised to partner with international smart grid vendors.

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Sensus Joins EnerNex and Oak Ridge National Laboratory to Heighten Cyber Security in Smart Meters with New Function Extraction (FX) Technology for Vulnerability Detection

New technology of behavior computation will help detect vulnerabilities in smart meter software

Raleigh, NC, October, 2011 - Sensus has announced a partnership with EnerNex and Oak Ridge National Laboratory (ORNL) to conduct a demonstration of the Automated Vulnerability Detection (AVUD) system. The AVUD project, funded by the Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, is developing a system for cyber security vulnerability detection in smart grid components. The system, known as the Function Extraction or FX system, will apply the newly developed technology of software behavior computation. The project will initially focus on improving security in software that controls smart meters.

As part of the joint collaboration, Sensus is providing smart meter architecture, firmware and source code to be evaluated, with EnerNex contributing expertise in evaluating smart grid utility technologies. ORNL devised the Function Extraction (FX) technology evaluation platform to perform static analysis of the compiled software and device firmware. FX technology is a powerful analytical technique that will be used to:

- Compute the behavior of software in all circumstances of use to determine everything it does
- Detect inclusion of both unintended and maliciously inserted vulnerabilities in smart grid components

By directly analyzing the compiled software, AVUD will be able to detect the inclusion of both unintended and maliciously inserted vulnerabilities in smart grid components. Based on this information mitigations for these vulnerabilities can be recommended.

Cyber security for energy delivery systems has emerged as one of the nation's most serious grid modernization and infrastructure protection issues. A team of ORNL and EnerNex cyber security experts is currently completing development of the AVUD system and will be demonstrating the technology with Sensus. High-Performance Computing (HPC) capabilities available at ORNL will be employed in the analysis. Success with this demonstration project could ultimately present opportunities to improve reliability and security for other smart grid components.

"We saw immediate value in this project," said Balu Ambady, security director at Sensus. "We were eager to join EnerNex and ORNL, to participate in an effort that can lead to early detection of vulnerabilities in smart grid components like meters, and development of uniform standards for improving data security of the smart grid applications."

According to Sandy Bacik, principal consultant, AVUD co-principal investigator at EnerNex, once the AVUD project is complete, the FX technology could prove beneficial in the development life cycle for smart grid components in tandem with ongoing quality assurance testing.

"The software present in smart meters is the initial target for this effort," Bacik said. "While testing can only provide information about the specific scenarios actually observed, static analysis with FX can provide information about system behavior under any circumstances of use, and provides a significantly more robust means of vulnerability detection."

Rick Linger, Senior Cyber Security Researcher, AVUD co-principal investigator at ORNL, said, "It is our hope and anticipation that this gives us a more powerful analysis capability to detect any vulnerabilities that may be present in the code."

Ambady added, "In the future, all advanced meter vendors would want to integrate this type of technology into their QA cycles."

Sensus continues to make data and cyber security high priorities and it is working to strengthen industry standards. Sensus has participated in several third-party certification processes for network integrity, and in early 2011 became the first advanced meter infrastructure (AMI) vendor to achieve both Achilles Communication and Practices Certifications for overall cyber security through the industrial testing and certification firm, Wurldtech Security Technologies. In addition, Sensus has licensed the IBM Tivoli Key Lifecycle Manager (TKLM) software to provide users of its FlexNetTM wireless AMI product with the leading encryption key management utility for all deployments of electric, gas and water metering devices and distribution automation solutions.

The program is scheduled to be completed by the end of 2012.

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"Campus Metabolism" at Arizona State University Offers Unique View into Sustainable Practices

By Robert W. Vandling, Technology Support Analyst/Coordinator, Arizona State University

The interactive Campus Metabolism ("CM") website at Arizona State University (ASU) offers a unique inside view into the university's commitment to sustainability initiatives, including its focus on the value of alternative energy resources and conservation. Beginning in 2004, and in partnership with the Arizona Public Service Energy Services (APSES) group, ASU installed utility-grade instrumentation to accurately monitor the energy usage of its residential and educational buildings on campus. Their current Energy Information System (EIS) was initially created from the gathering of this data.

Drawing on comprehensive data from ASU's Energy Information System (EIS), Campus Metabolism brings a wealth of valuable information to students, researchers and the public. It also supports the initiatives of ASU's Global Institute for Sustainability. CM currently covers initiatives at the university's Tempe (AZ) campus but will expand, along with the EIS system, to include ASU's three other campuses in the Phoenix metropolitan area.

The EIS system draws on a technology platform from Kepware Technologies for capturing data from the field as well as a SCADA system provided by Control Microsystems (now Schneider Electric), communicating with field data devices located throughout the campus to pull and translate data. The resultant EIS is a secure, Internet-based application that incorporates a user friendly, graphical representation of both real-time and historical data. It documents energy usage at the ASU Central Plant, the Combined Heat & Power (CHP) plant and the rest of the Tempe campus as well as providing a way for the ASU staff to monitor and report energy usage in various buildings across the main campus. It also provides the necessary information to allow the staff to allocate utility usage to the various campus buildings.

ASU's Campus Metabolism site allows real-time energy usage data

A dedicated fiber optic network connects all campus buildings to the core EIS database. Key data points such as consumption, temperatures, pressures, and flows for electricity, steam/hot water, chilled water, condensate return and renewable energy production are monitored on a continuous basis from each of these buildings on the Tempe campus.

History of Commitment to Environmental Best Practices

With more than 82,000 students and four campuses, Arizona State University is the largest public research university in the United States. From its beginnings in Tempe, ASU has expanded to include a West campus, a Polytechnic campus and its downtown Phoenix campus. And, as home to The Global Institute of Sustainability, ASU is dedicated to the advancement of research, education, and business practices for an urbanizing world.

The Global Institute of Sustainability is the hub of Arizona State University's sustainability initiatives. The Institute advances research, education, and business practices for an urbanizing world. Its School of Sustainability, the first of its kind in the U.S., offers trans-disciplinary degree programs focused on finding practical solutions to environmental, economic and social challenges. The Institute also provides leadership and coordination for university sustainability initiatives.

ASU's framework for addressing the challenges of sustainability builds upon four cornerstones; these are: Education, Research, Business Practices, and Global Partnerships & Transformation. The School of Sustainability trains the next generation of sustainability practitioners, entrepreneurs, and leaders. An emphasis on sustainability across the curriculum directs coursework, research, and outreach toward solving today's most important problems. A university-wide commitment to sustainable operations encompasses all units at all four campuses. The program places a special emphasis on urban environments, utilizing Greater Phoenix as a living laboratory to address issues with water, energy, transportation and livability.

Making sustainability part of its everyday practices, ASU embarked on an aggressive program of energy conservation and education. Today more than 100 campus buildings with thousands of I/O points are being monitored by EIS at the Tempe campus alone. Energy savings have come in many forms, from improved insulation to energy efficient lighting fixtures but especially from renewable resources like solar.

"The interactive nature of the Campus Metabolism website engages users and entices them to consider their energy impact"

Currently ASU generates about 5,7 megawatts of solar power for its Tempe campus, 4.6 megawatts on its West campus, and 77kW on its Downtown campus for a total of 10.3 megawatts of electrical generation. Furthermore, by the end of 2012, when EIS has been expanded to the other three campuses, it's expected that more than 18,2 megawatts of solar power will be utilized by ASU and monitored by the EIS.

Contributions of Solar Power

The Phoenix area boasts an average of 334 days of sunshine a year, which puts ASU in an enviable position to be able to leverage opportunities for solar power. (ASU is also the world's largest university in terms of solar generation with over 9 megawatts of solar power online today.) Overall, ASU has been able to reduce electrical energy consumption by five megawatts during the past couple of years through ongoing performance contracts.

Ameresco Southwest (formerly APS Energy Services) has served as a strategic partner with ASU, with a series of performance contracts and metering projects that have helped ASU modify its systems for even greater cost savings. In fact, the university has created a new fund called the Sustainability Initiative Renewable Fund. Through this fund, ASU is taking the savings generated and putting it into new ways of funding energy renewables that have rapid ROIs. All of the additional solar being added and all of the additional points to be monitored – including the other three campuses – will require significant expansion of the EIS database.

Building the Infrastructure

The entire EIS network on the Tempe campus has a dedicated fiber network completely separate from the normal network backbone. Wherever a fiber connection could not be made, a secure VLAN connection isolated from the student traffic was installed so that it could still be connected to the same dedicated EIS fiber network.

ASU added utility-grade meters to all the buildings but didn't incorporate any of the building management system, which is completely separate from the EIS. This created the need for a separate infrastructure that continues to evolve. The new meters pull information back to a central server, which provides an instantaneous look at the data. One-minute updates are performed for the first hour, after which the information is rolled up into 15-minute averages. A sophisticated alarm system is also in place that relies on five-day averages to send out warning and alert notifications if utility consumption rises or falls within those targeted parameters.

The communications network connects the field PLCs (Programmable Logic Controllers acting as field data devices) with the SCADA and telemetry applications and pulls data from the utility-grade meters for electricity and utility monitoring. The SCADA system translates the data into Modbus TCP/IP and is then pulled back to the communications server. From there, the data is converted to OPC, and then from OPC into another application ("OPC Systems.NET"), which contains the tagging and data logging capabilities. It is at this point that various computations (e.g., translating instantaneous Kilowatts into KilowattBTUs) are performed.

Similar calculations for flow and temperature can also be performed on the chilled water side, turn it into tonnage. All of this is done in the tag database in OPC Systems, after which OPC Systems moves it into the OPC Datalogger and pushes it into the SQL database.

Campus Metabolism Supports Sustainability Curriculum

Campus Metabolism was originally the idea of ASU research engineer Joby Carlson. As the lab manager for ASU's National Center of Excellence on SMART Innovations, Carlson wanted to be able to monitor energy use and put it in front of consumers, but also incorporate water and waste with energy data. His goal was to be able to compare data on multiple buildings on campus and teach consumers how they could reduce their energy use. Finally, he envisioned utilizing ASU talent to put it all into a Web-based tool that everyone could understand and use.

Campus Metabolism debuted on May 15, 2008, the result of a joint project that included the Global Institute of Sustainability, ASU Facilities Management, the National Center of Excellence on SMART Innovations, University Student Initiatives, Barrett (the Honors College), the office of the University Architect, the College of Design, the Ira A. Fulton School of Engineering, the Department of Psychology, the ASU student chapter of Engineers Without Borders, and APS Energy Services.

Carlson noted that to see architects, engineers, sociologists, biologists, web designers, students, faculty, staff, investors all at same table talking about one site showed that management at ASU is interested in change, that sustainability is an institutional objective, and that the university is interdisciplinary in approaching problems, not only in research, but also in daily operations.

"Campus Metabolism" at Arizona State University Offers Unique View into Sustainable Practices

At the unveiling of Campus Metabolism, it included only energy data and for only one facility. Currently Campus Metabolism contains data from 24 buildings on the Tempe campus and all 21 of the solar power installations. New versions continue to roll out as more and more buildings and systems come online. Plans call for bringing the entire EIS database into Campus Metabolism, where users will be able to view the university's entire utility structure for all 100 buildings.

At the Campus Metabolism website, users can view energy data not only in kilowatt hours and BTUs, but in other easily understood measures, such as how many CFLs that energy could light up or the number of gallons of gasoline that would have to be burned to generate it. In addition, users can easily compare buildings against one another or, against historical data – for last week, last month, or last year.

Students and faculty can compare electricity, heating and cooling information across multiple buildings on the campus

Users are able to view overall energy use in real time in select buildings, view a campus map and click on specific areas to determine energy consumption. Additionally there is a "virtual-rooms" tab that presents an interactive opportunity to learn what energy impact certain items, like lamps, radios, cell phones, etc. have on consumption in virtual office or virtual dorm room spaces.

A new aspect of the site offers multi-point overlays and identifies the impact of temperature, wind and other weather conditions. With colorful charts, graphs and history, Campus Metabolism serves as a significant teaching tool for both professors and students at the Global Institute of Sustainability.

With one of the largest student and staff populations in the country, ASU is larger than many small cities. This means that relatively tiny changes in the university's resource policies or consumption habits can produce a large impact. Campus Metabolism is the tool to help make that happen. In any situation, if you can quantify something accurately, you can understand how your decisions impact the system. Campus Metabolism provides real clarity into campus energy usage trends – information that can be used to make fact-based decisions leading to future reductions in ASU's carbon footprint and reaching its sustainability objectives.

ABOUT THE AUTHOR

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2011 GreenWays Series

Leadership for a Clean Energy Future

New York Independent System Operator (NYISO)

By Rick Gonzales, Chief Operating Officer and Rana Mukerji, Senior VP – Market Structures

The New York Independent System Operator (NYISO) administers the wholesale electricity market for New York State. Its primary role is running a day-ahead and a real-time market for electricity, which in turn, provides generators with a financially binding schedule of operation. As anticipated load, available generation, and system conditions change from the time the day-ahead market is settled, the NYISO also operates a real-time market that's intended to efficiently and economically balance system changes. However, the following interview with Rick Gonzales, the NYISO's Chief Operating Officer and Rana Mukerji – Senior Vice President, Market Structures – goes beyond the ISO's traditional activities to focus on the integration of renewables in overall transmission planning and market operations. I think that anyone involved in these areas – either directly or indirectly – will find their remarks every bit as interesting and insightful as I did, especially in light of the growing integration of renewables all across the grid. – ***Ed.***

EET&D: I think most of our readers have at least a cursory understanding of what being an Independent System Operator – or ISO – is, but there are probably also a lot of people that don't completely understand what an ISO actually does. So, I think it would be useful to start off with a quick review of the rudiments involved.

Gonzales:That's a fair assessment, Mike, and probably a good place to begin. As you already know, the NYISO runs a day-ahead and a real-time market for electricity, providing generators with a financially binding schedule of operation. And, as anticipated system conditions change, once the day-ahead market is settled, the NYISO also operates a real-time market designed to efficiently and economically balance any system changes that may occur.

Mukerji: And on a more detailed level, the NYISO also schedules transmission service for direct transactions between buyers and sellers – known as bilateral transactions. While the cost of energy in a bilateral transaction is negotiated outside the NYISO's marketplace, a bid-based system is used to make transmission service available. Roughly 95 percent of energy is scheduled in the day-ahead market, while the remaining 5 percent is accounted for in the real-time market. Typically, about half of the energy settled in the day-ahead market is scheduled through bilateral contracts.

EET&D: How would you characterize the essence of what an ISO does in addition to managing the day-ahead market and bilateral power transactions?

Gonzales: Among the other critical functions we perform is administering competitive markets for key ancillary services that are required to support the power system. The two most important ancillary services are reserves and regulation. The NYISO aims to minimize the cost of serving electricity by co-optimizing the cost to provide energy, reserves, and regulation in its security constrained economic dispatch algorithm.

EET&D: Rana, without getting into too much technical detail, could you perhaps elaborate just a bit more on how that all plays out as a practical matter?

Mukerji: Sure. Another of the fundamental challenges of grid operations is constantly maintaining a balance between electric supply and demand. Typically, this is accomplished by moment-to-moment changes in output by generators that provide regulation service. In New York, however, competitive wholesale power markets have been in place for more than 10 years, so regulation service is provided on a least-cost basis by competing suppliers rather than a singularly contracted source.

EET&D: But it is my understanding that you have gone well beyond just dealing with conventional energy sources; is that correct?

Mukerji: Yes, while many grid operators must rely exclusively on regulation service resources from conventional hydropower and thermal-generating units to keep supply and demand in balance, the NYISO has moved to take advantage of advanced grid-scale energy-storage facilities known as limited energy-storage resources (LESRs) to provide this crucial service. As the name implies, LESRs store electricity but are limited in the amount of time they can sustain electric output.

EET&D: So how do you handle the obvious issues around intermittency that are an implicit concern when it comes to renewables integration?

Mukerji: Well, I guess you might say that the simple answer is energy storage, but the NYISO has also developed new market rules and related software specifically designed to support LESRs. In fact, when the Federal Energy Regulatory Commission (FERC) approved NYISO tariff revisions in May 2009, the NYISO became the first grid operator in the nation to establish federally approved energy-storage market rules and deploy associated software and control systems. As with all market and system changes, the NYISO worked with stakeholders through its shared-governance process to ensure the changes would meet the needs of LESR operators without creating unintended consequences for the marketplace.

EET&D: What type – or types – of storage are being used in your service areas?

Gonzales: With its existing major hydropower pumped-storage facilities, New York State has a well-established foundation of electric energy-storage resources. The New York Power Authority (NYPA) Blenheim-Gilboa facility is the fifth-largest pumped-storage project in the nation. The 1.1 GW project began providing power in 1973. A major revitalization and upgrade of the facility was completed just this year.

The state's other large pumped-storage facility is the Lewiston Pump-Generating Plant. Part of NYPA's Niagara Power Project, Lewiston was built in the early 1960s and is capable of producing 240 MW. Moreover, NYPA recently announced a 10-year, $460 million modernization project to upgrade the facility.

EET&D: Again, although we see terms like pumped storage more and more these days, it would probably be good to explain exactly what that means for those who may not be as familiar with it.

Gonzales: Pumped-storage units use electricity during the overnight hours, when system usage is low, to pump water into elevated reservoirs. As system electric usage increases during the day, the water is allowed to run back down through the turbines to generate electricity. Pumped-storage technology was originally viewed as a complement to large nuclear units, which cannot be cycled down during the lessened demand of the overnight hours. According to the U.S. Energy Information Administration (EIA), there is well over 20GW of pumped-storage generating capacity in the country.

EET&D: Rana, in your opinion, is there something in particular that is driving the proliferation of these changes, either in New York or in general?

Mukerji: Yes, I can say that market signals and increasing demand for regulation service have attracted the attention of developers whose new technologies are well suited to serve the regulation market. Emerging storage technologies being introduced in New York are different in scale and capability, representing a new class of resource to create a more robust, reliable power system and lower costs for consumers.

EET&D: Another factor that concerns many people is the speed at which renewable resources can respond to rising demand. How do you handle that part of the equation?

Mukerji: The LESRs currently in development will store limited grid-scale generating capacity, but their response times are what really set them apart. With an instantaneous ability to switch from drawing energy to releasing energy, they are ideally suited to provide regulation services. The use of advanced, grid-scale storage technologies to respond to second-by-second fluctuations in demand is a promising addition to New York's resource mix that will help to improve system efficiency and reduce the need to burn fossil fuels to provide regulation service.

EET&D: There are several technologies out there that would seem to qualify as limited energy-storage resources, or LESRs. Can you identify some of the LESR technologies being employed by the NYISO and briefly describe their functionality along with any others that are being considered as having potential in the future?

Mukerji: The main LESR technologies currently under development in New York State include flywheels and advanced batteries. A flywheel energy-storage system is a rotating mechanical device (i.e., a rotating disk) that uses electricity from the power grid to create kinetic energy that can easily be converted back into electric energy when needed. And, as most people know, battery storage systems simply convert electricity into chemical energy for later release. We're also looking at some other developing technologies that could act as LESRs in the New York market down the road. These include flow batteries, fuel cells, ultra-capacitors and compressed-air energy storage.

EET&D: There's been a lot of discussion about electric vehicles lately, not just as an energy saving measure but also as a large-scale distributed energy storage resource. Is that something that could or will figure into you future plans?

Gonzales: Indeed, plug-in electric vehicles (PEVs) may one day act as energy-storage service providers for both the home and the electric grid. In March, the ISO/RTO Council, an organization representing North America's ten electric system grid operators, published a study examining the feasibility of deploying various smart grid tools and services to allow grid operators to tap into the batteries of PEVs as an innovative energy-storage and distributed-energy resource to balance local energy needs.

The New York Public Service Commission and FERC have also acknowledged the important role that energy storage plays in the implementation of smart grid technologies – including that for potential PEV grid integration and other applications. In addition, increased amounts and types of electric energy storage also could be combined with Smart Grid technologies to support the future integration of large amounts of renewable energy into the electric grid, helping state and federal policy-makers meet renewable power goals.

EET&D: Are there any projects currently under way that would add substance to the viability of these technologies?

Gonzales: Yes, there are indeed. For example, Beacon Power Inc. and AES Energy Storage LLC are two companies currently developing grid-scale LESR facilities in New York based on flywheel and battery technologies. Beacon Power recently began operation of a 20 MW flywheel energy-storage facility in Stephentown, N.Y. Beacon's system utilizes 1 MW flywheel modules consisting of 10 individual 25 kWh/100 kW flywheels integrated into a plant that can provide up to 20 MW of regulation service.

AES Energy Storage is developing three 20 MW battery storage facilities in the upstate New York counties of Broome, Onondaga and Niagara.

EET&D: These sound like some pretty exciting projects, and we hear a lot about these technologies as just that – technologies. What has been the driving force behind getting them to a pragmatic stage?

Mukerji: As stated earlier, energy, reserves and regulation have been competitively supplied since the formation of the NYISO. However, when the markets were initially developed, no one anticipated that regulation could be provided as a product separate from energy. Consequently, it was assumed that only generators could provide regulation service. None of these projects would have been possible without the changes to the NYISO's markets.

EET&D: What were some of the steps that led up to those changes?

Gonzales: In order for New York's market to accommodate LESRs, several steps had to be taken. First, a new type of regulation service provider had to be defined – one that would be characterized by its ability to provide continuous six-second changes in output but would not be able to sustain continuous operation at maximum energy withdrawal or injection. Once this new category was established, software changes were then made to bidding and control systems.

Mukerji: That's right. The NYISO markets traditionally evaluate generator bids for energy and ancillary services simultaneously. The market software has been updated to allow LESRs to be evaluated only as regulation service providers, not as energy suppliers. By removing the requirement to offer energy and by creating an opportunity to sell regulation as a stand-alone product, the NYISO created a means for this new class of resources to participate in the marketplace. LESRs will be compensated for their regulation service in the same manner as traditional suppliers, meaning that they will receive the market-clearing price for each megawatt of regulation service provided.

EET&D: So how do reserves figure into this competitive operating model?

Mukerji: Reserves are resources available to provide fast ramping power in the event of a unit or line trip. Reserve resources can either be spinning – on-line, with additional ramping ability – or non-spinning – off-line, but able to start and synchronize quickly. The NYISO maintains varying levels of reserves in different parts of the state. I'm sure that Rick can explain how that works in a greater detail…

Gonzales: Regulation providers keep load and generation in constant balance. NYISO performs a system wide re-dispatch every five minutes to balance generation with short-term predicted system changes and relies on regulating resources to quickly adjust their output and consumption, and continuously balance conditions within those five-minute dispatches. Resources selected to be regulation providers must be capable of simultaneously providing the service in both the upward and downward directions. Regulation resources are a key component of integrating large amounts of intermittent resources, such as wind, without compromising system reliability.

EET&D: Speaking of wind, let's talk about that. As I understand it, you have also integrated a wind component into your overall resource plan. Is that correct?

Mukerji: Yes, wind energy provides many benefits, such as a low energy costs and a near-zero carbon footprint; but it also brings new challenges, a consequence of wind's intermittent nature. These challenges must be overcome by ISO/RTOs and other entities responsible for the reliable and efficient operation of the power grid.

EET&D: The intermittency of renewables – particularly wind – is of course, a big issue. How do you deal with that aspect without jeopardizing overall network reliability?

Gonzales: The intermittency of wind generation can be accommodated more effectively when the balancing area is large. This means that regional coordination is essential as we increase the proportion of wind and other intermittent sources of renewable power. The NYISO is working with its neighbors to implement an initiative called "Broader Regional Markets" that allows this to happen.

The broader regional markets initiative involves more frequent interchanges with neighboring control areas (currently interchanges are done hourly), coordinated congestion management (where transmission limitations are alleviated by re-dispatching generation on a regional basis), consistent pricing at power interchange points, and charging congestion costs to transactions that cause congestion.

EET&D: Is this fully operational across the NYISO region at this point?

Mukerji: No, the NYISO implemented its first Broader Regional Market rule this summer. In this implementation, NYISO increased the frequency of interchanges with Hydro Quebec from once every hour to once every 15 minutes, and this will be increased to once every five minutes by 2012. This increased frequency of transactions will allow NYISO to utilize the immense hydro storage capacity of Quebec to balance the intermittency of wind. Hydro Quebec also will benefit from the ability to buy renewable energy at low prices and conserve hydro resources that can then be offered at times of greater need. NYISO also will be implementing more frequent scheduling with ISO New England and PJM. This will allow wind energy to be more effectively integrated regionally.

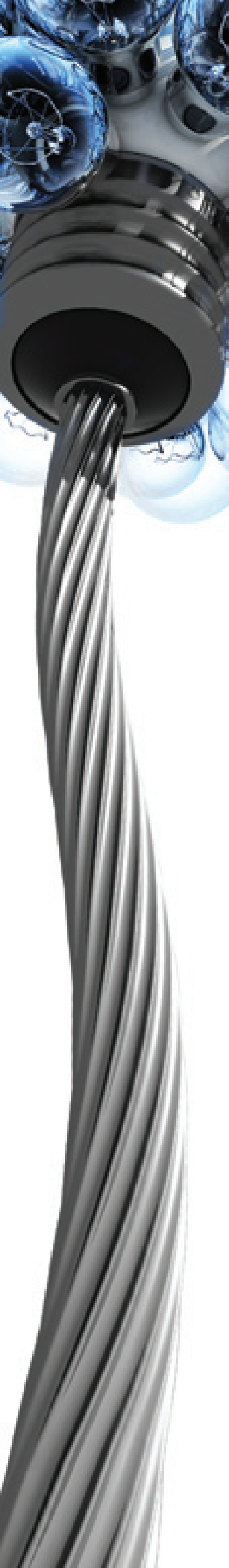
EET&D: There has been a lot of discussion lately about bringing the various components of the Bulk Energy System closer together. In fact, NERC just recently issued a plan to adopt a revised definition for the Bulk Electric System and a phased approach to regional integration. Are there any pertinent changes going on that would go beyond the NYISO footprint?

Gonzales: The NYISO has begun working with individual utilities around the state to implement the smart grid initiative, which involves the installation of capacitor banks and phasor measurement units – or PMUs – on the bulk transmission system throughout the state. The capacitor banks will improve the efficiency of the state's bulk transmission system by reducing the amount of electricity that is lost when carried over long distances, thus saving the state approximately $9 million each year. The installation of PMUs and integration of the data provided will improve grid operators' visualization capabilities and situational awareness. Eventually, the NYISO's PMU network will connect with PMU networks in New England, the Mid-Atlantic, the Midwest and Ontario to create broader situational awareness throughout the Eastern Interconnection, the NYISO explains.

EET&D: Rick, you get the last word. Anything you'd like to add before we close?

Gonzales: Two things. First, I'm very pleased to note that New York has developed new market mechanisms intended to effectively incorporate large amounts of renewable energy in the future and as a result, is positioned to effectively accommodate up to six times the current levels of intermittent energy without impacting system reliability. This will help drive new investment in renewable energy in New York as well as significant consumer benefits.

And finally, we're very excited to report that the NYISO has broken ground on a new $35.5 million primary power control center facility, which is being built adjacent to the NYISO's headquarters in Rensselaer, New York – near Albany. This new 64,000 square-foot control center is being developed to replace the NYISO's existing, 42-year-old control center in Guilderland. Construction of the new control center is scheduled for completion in 2014, while the overhaul of the Guilderland facility is set to be finished in 2012.



LightsOn

What a Green Energy Efficiency Program Means for Business and Utilities

By Dara O'Neill, CEO, Efficient Energy America and Jim Vonderhaar, VP & General Manager, Regional Operations, Summit Energy Services

It's no secret that energy costs are on the rise, which inevitably translates to higher electric bills for businesses. With no end in sight, it's hardly a surprise that energy efficiency programs are continually gaining more widespread attention and support from both businesses and utility providers. Many businesses hope these programs will help them gain better control of rising energy costs, while also addressing growing pressure to be more environmentally conscious. Utility companies are also not immune to the rising energy costs.

A New Way Forward

In an effort to reduce electricity usage and ensure that they can continue to provide service to a growing number of customers, utilities are providing incentives to businesses that implement energy efficiency programs. And while businesses are adopting simple practices – such as turning off lights, using less hot water and even keeping the thermostat at a less comfortable temperature – to reduce usage and be more environmentally-friendly, these measures often aren't enough to provide any significant savings in energy costs.

New energy efficiency technologies on the market today provide a higher level of automation and intelligence than ever before, while also helping business owners reduce their electricity usage and costs. Additionally, there are many services available to help businesses navigate the often confusing landscape of utilities, energy supply and demand, and making smart decisions when it comes to energy usage. But can an energy efficiency program really save a business money? And what does a successful energy efficiency program mean for the utility companies?

For any business serious about implementing a successful energy efficiency program, identifying the right building optimization technology can be the first important step. Typically, HVAC systems account for a large portion – in many cases, more than 50 percent – of the total energy used by commercial buildings. HVAC units generally over-consume and under-perform due to a number of factors, including poor initial building design, lack of proper maintenance, poor control strategies and advanced equipment age, just to name a few. Heating and cooling a building is often controlled by setting fixed, pre-programmed temperature targets with simple "on/off" operations or by using a timer.

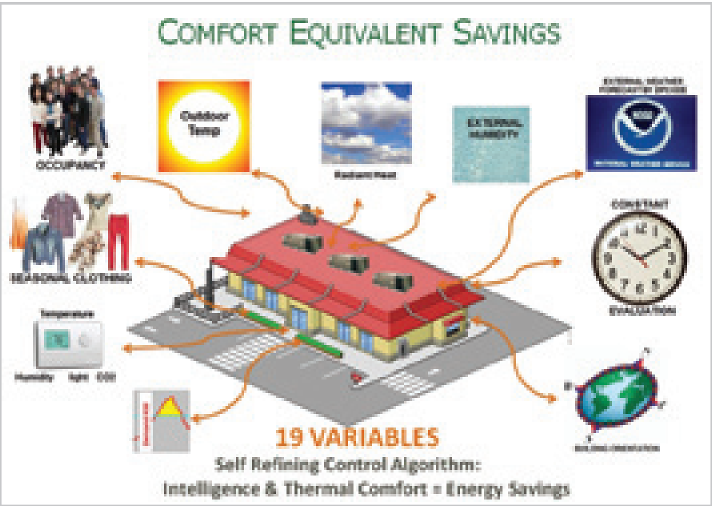
Overcompensation = Wasted Energy

Even in the best-maintained systems, business owners often compensate for HVAC systems by making heating and cooling times longer than necessary to ensure an "optimal" temperature is reached at the right time – typically during a building's business hours. And, aside from temperature inside the building, other environmental influences are not normally taken into consideration with the controls for a HVAC system. For example, an overcast day will likely require less HVAC output than a sunny day. This leads to unnecessary over-usage of equipment, resulting in wasted energy – and higher electric bills.

Replacing older HVAC units with newer, more efficient ones can be expensive and is usually not even necessary to reduce energy costs. More and more businesses are looking for technology solutions that can help *existing* HVAC units to operate more efficiently, without sacrificing comfort inside the building. This can be especially challenging when considering all the factors that can influence the temperature in different areas of a building. Typically, most energy management systems only take into consideration the temperature in a single area inside a building, without taking into account the many variables that affect thermal comfort.

Intelligence + Thermal Comfort = Energy Savings

Like many other businesses, Platinum Corral – a multi-state franchise operator of Golden Corral Buffet-Grill restaurants – had implemented simple measures in an effort to reduce its utility bills, including scheduled and preventative maintenance on its HVAC compressors. Yet the company was not seeing a significant savings and typically paid around $9,000 per store every month for gas and electricity costs. To help reduce electricity usage and costs, Platinum Corral installed E2America's intelligent building optimization technology in all 30 of its stores. Platinum Corral initially installed the technology in five of its Golden Corral restaurants, and immediately saw its electricity bills decrease by as much as $700 per store each month.



In order to ensure the maximum reduction in energy consumption, while still providing a comfortable climate, building control systems must take a wide range of factors for controlling the HVAC system into account.

With restaurants located across five states, Platinum Corral worked with several of its local utility companies to qualify for a $5,000 - $8,000 rebate per store for installing energy efficiency technology. Most utility companies offer these incentives to help businesses implement programs and technologies that can help them reduce energy consumption and demand. These reductions can assist utility executives make more accurate predictions about their grids, including consumption and demand analyses, generation, transmission and rates.

When a business receives utility incentives to install energy efficiency technology, that business in return assigns "credits" or RECs (Renewable Energy Certificates) back to the utility, as a tradeable commodity. For every 10,000 kWh saved through energy efficiency technology, the utility company receives one REC. So while the utility company pays a one-time incentive to the business, the utility continues to receive RECs over time as the business reduces its consumption.

Energy efficiency technologies like E2America's assist with transmission and distribution loading issues by lowering both consumption and demand on small to medium-sized commercial and retail buildings. Although these buildings use less energy than large commercial and industrial buildings, when enough buildings are added in a specific geographic area the aggregate savings have the potential to significantly lower the utilities demand.

Platinum Corral was able to install the retrofitted system directly to its existing HVAC units, which included various brands and ranged in age from one to 25 years. A new Master Control Unit with wireless controls for the system was installed in each store and connected to an Internet gateway. Instead of relying on set temperatures and time schedules to determine the energy used and HVAC costs, the new system uses a self-refining logic that calculates the optimum temperature every minute of the day.

Optimize, Prioritize, Save

This centralized control removes the incidental waste resulting from striving to achieve one set temperature. By allowing the Master Control Unit to intelligently calculate what the optimum temperature should be, the system uses the least amount of energy possible and improves the internal conditions of the building. Staff members no longer have to alter heating and cooling schedules or make random temperature adjustments, which had been contributing to excess electric consumption.

The system also uses an algorithm to lower demand charges by prioritizing units and ensuring that all units aren't running at the same time. The technology automatically calculates intelligent start and stop sequences so the HVAC units only run for exactly the amount of time required to take the restaurant from its nighttime temperature to its target daytime temperature. This means no unnecessary usage of power before opening or after closing each day. The automated demand response functionality that is embedded in the self refining algorithm also enables the utility company to lower demand on participating buildings by an additional 10-15 percent at the touch of a button.

To further reduce energy consumption, the technology takes into account a wide range of factors instead of just target set temperature for controlling the HVAC system. Other factors considered include external weather data, internal and external humidity, solar heat load, building position and sunlight, typical clothing worn for the time of year, and building occupancy. Taking these factors into consideration allows the HVAC units to run more effectively without causing disruption, while also providing a more comfortable climate for staff and customers.

Wireless temperature and humidity sensors were also installed in various areas in each building to provide Platinum Corral with continuous reports of how the HVAC system is functioning and to provide daily and monthly snapshots of energy and cost reductions. As the company installs the technology in all of its locations, Platinum Corral expects to lower its electricity costs by as much as $252,000 annually. Additionally, the platform is scalable to add intelligence to each facet of energy consumption.

The Right Tool for the Job

Ultimately, the right energy efficiency technologies enable utility companies to do more with the energy they are currently generating by reducing waste. When enough commercial customers have installed these technologies, utilities can postpone or delay new generation budget decisions, translating to greater profitability. A megawatt saved is the same as a megawatt generated. Therefore, energy efficiency should be viewed as “low-hanging fruit” for both the utility companies and the businesses they serve. Saving now in order to avoid new energy generation projects in the future should be the goal for all utility companies and businesses in these challenging times.

Make A Plan

While identifying and implementing the right technologies can be a key component of a successful energy efficiency program, understanding how to make the most of fluctuating energy costs can also help a company save money when it comes to buying energy. Energy – whether electricity, natural gas or oil – is a commodity. And, like all commodities, prices change fast and frequently, varying by geographic region and even time of day. Cost is important but so is predictability. Having a strategic plan helps companies make informed decisions, taking all factors into consideration. The first step in formulating this plan is identifying a knowledgeable partner that can develop a comprehensive energy assessment.

Unlike other commodities, a facility’s location plays a major role in determining how it can buy energy. Typically, in a regulated market buyers must purchase energy from a single supplier, the local utility company. In a deregulated market, electricity suppliers compete for business. The regulation/deregulation of natural gas and electricity varies by geography. In some states both commodities are deregulated while in other states just one or the other is deregulated. These variations make a single approach to buying for multiple markets completely impractical.

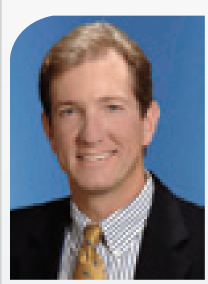
Conclusions

Buying energy is extremely complex with many moving parts. Thoroughly understanding all the factors that can affect pricing – such as location, time of year, weather forecasts, regulatory and legislative initiatives – as well as how and when you use the energy, is absolutely critical. Once all these factors are considered and a strategic plan has been formulated, it is important to ensure that all suppliers are providing pricing on an “apples-to-apples” basis.

Variations in any one of these factors and how they are applied can have a significant impact on the actual price you ultimately pay. Once a supplier’s bid is chosen, negotiating the actual contract is the next critical step. Summit Energy will assist the customer in contract negotiation, ensuring there are no hidden costs or pass-through charges, while also keeping the client as flexible as possible within the terms of the contract.

Finally, keeping track of the energy reductions achieved is key to demonstrating success and charting performance towards goals. Working with a trusted partner that understands the numerous utility rebates and incentives, as well as the ever-changing legislation, can help companies even further supplement their reduction activities. And with proven, automated technology and services readily available, it is easier than ever for businesses to affordably implement a true energy management program that can result in reduced electricity usage and costs.

Dara O’Neill is CEO for Efficient Energy America (E2America). E2America develops building optimization and real-time reporting systems that are used by leading restaurant and retail chains, as well as other commercial buildings across the U.S.



Jim Vonderhaar is General Manager and Vice President of Regional Operations for Summit Energy Services. Summit leads companies to cost-effective strategies by providing energy procurement, sustainability consulting, energy procurement, rate analysis and demand response services.

Solar is Hot in Ontario

By Tom Crawford, Senior Manager
Capgemini Global Smart Energy Services

Rooftops across Ontario are being transformed. An aerial view of the province reveals that solar panels cover the flat rooftops of hundreds of commercial and industrial buildings. With more than 400 rooftop installations and counting, OZZ Solar ranks as one of the largest solar developers in Canada. The company's aggressive growth resulted from Ontario Power Authority's feed-in-tariff (FIT) program. In order for the company, its partners and its customers to fully realize the benefits of the FIT program however, an effective solar monitoring system would prove critical.

FIT Programs Ignite Solar Industry

Enterprises across Canada are putting solar installations on their buildings' rooftops to reap the benefits of the Ontario Power Authority's FIT program. Feed-in tariffs offer cost-based compensation to renewable energy producers, ensuring price certainty and long-term contracts with the government. This helps finance renewable energy investments. Germany and Spain rank at the forefront of the solar energy industry, resulting primarily from these countries' FIT programs.

Solar energy producers receive higher compensation than producers of electricity generated from coal or natural gas, because solar technology is more costly, and this raises generation costs. These building owners can generate power for their own operations, and sell the excess power back into the grid for generous compensation. Solar owners participating in FIT also receive guaranteed grid access. In order for a rooftop solar installation to qualify for Ontario's FIT program, the installation must be located on an existing, permanent building intended for a primary purpose other than supporting a solar installation.

Solar System Monitoring is Key to Reaping FIT Rewards

FIT programs tie their payment levels to the performance of the solar installation, placing the incentive with producers to maximize the overall output and efficiency of their project. The more power a solar installation generates, the higher the compensation amount. Solar installation owners, therefore, reap the maximum benefit from their investment through solar system monitoring to ensure maximum performance.

Solar requires granular monitoring of installations down to the string level to verify that the solar systems generate as much power as technologically possible. OZZ Solar named Capgemini as a solution provider for a planned test of a granular monitoring solution at its 130-kilowatt-hour solar installation on the corporate headquarters rooftop. If the test was successful, granular monitoring solutions would be implemented at all of its installations.

Monitoring at the Meter on the AC Side is Not Enough

A multi-tiered monitoring approach that provides diagnostic information on all aspects of rooftop solar systems was selected based on Capgemini recommendations. And although other companies in the industry offer solutions that monitor at the revenue-grade meter on the AC side, this limited monitoring does not pinpoint individual solar panel malfunctions. To also provide string-level granular monitoring on the system's DC side, Capgemini teamed up with DECK Monitoring, a maker of monitoring software.

"If a solar panel goes down, it tends to bring down the whole string," said Will Shortt, Deck Monitoring CEO. "In a large, multi-panel project, you wouldn't know if one panel was down from monitoring the whole system, either from the inverter or the meter. We provide broad monitoring information but then also drill down to the string level."

How String-Level Granular Monitoring Works

Capgemini built a control center to provide on-site monitoring at the headquarters facility. The control center's monitoring team compares the output of strings within the same solar system. The team uses this data to identify wiring, shading, or other minor maintenance issues that would otherwise escape detection. (**Figure 1**)

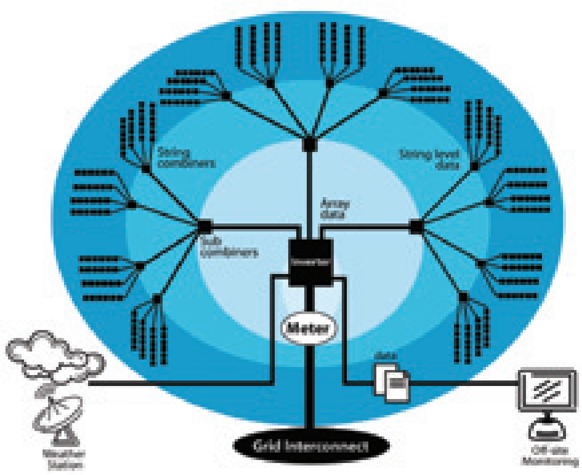


Figure 1. System performance is monitored at the string level, and this data is used to identify wiring, shading, or other minor maintenance issues that might otherwise escape detection.

To track the rate of hardware degradation, the monitoring team also compares the strings' output over time. This can minimize system efficiency losses and downtime due to unnoticed decreases in performance or unanticipated failures. The monitoring system tracks the performance of the specific solar system compared to other existing solar systems so that future installation designs can be built on lessons learned from the comparative study.

The monitoring solution employs a data-intensive back-end administrative panel that monitors the performance of each portion of the system. As part of the administrative panel, the billing and reporting center tabulates production data over variable time periods, the projected electricity purchase price, and a revenue percentage to produce roof rent estimates for income reconciliation purposes.

The data acquisition software, called the "gateway," communicates with supplied meters and data-gathering hardware that connects via Modbus or Pulse data protocols, or wireless signals. The included CT meter measures system generation after the inverter on the AC side. The gateway stores the data for 90 days using flash memory in the event that Internet service fails. The monitoring system pushes the data to the servers every 15 minutes, automatically updating the data in the dashboard and administrative panel. In addition, a third-party hosting and backup company stores data off site.

The solution's hardware components allow for expandability, provide high-resolution data, and have low failure rates. Demand monitoring capabilities, integration with other building energy management systems, and another solar array or weather station can be added at any time.

The solution can also be integrated into the local utilities outage management system or distribution management system and provide real-time connectivity and control as part of an integrated smart grid solution.

Monitoring Delivers Valuable Data

As soon as the system was set up and the communication link was established, Capgemini began remotely monitoring the installation, comparing the power output of each string against other strings. The monitoring team cross references pre-installation energy production forecasts and actual performance data against site-specific weather data to predict power output, identify variations from the prediction, and identify system failures requiring on-site intervention to maximize power output. (**Figure 2**)

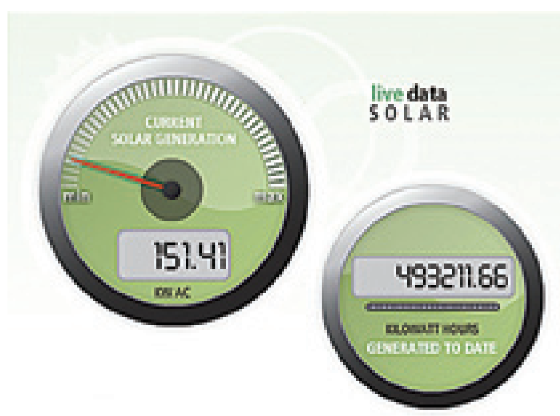


Figure 2. Solar equipment is remotely monitored to track how much power is generated in real time and to date.

When system alarms sound indicating possible equipment malfunctions, control center analysts determine if a repair crew should in fact be dispatched. For example, a sunny but snowy morning in winter may not result in power generation if solar panels must heat up after the snow slides off. The lack of power generation does not indicate faulty equipment, however, so the operations center does not need to dispatch a repair crew. Once control center analysts determine the need for on-site troubleshooting, a trouble ticket is issued and a request for a local operations and maintenance team is issued to dispatch a qualified crew.

Whenever possible, the control center analysts identify the failed or underperforming strings and their relative geography on the array to decrease repair time. The system also tracks historical system and maintenance issues. The maintenance process is also monitored to ensure that repairs under warranty are covered as well as tracking and recording work tickets.

Solution Yields Other Benefits

Studies indicate that granular monitoring of solar installations typically increases power production by five percent over the lifetime of the system. Optimal power production will enable users to receive the maximum return on their investments in solar installations. With long-term guaranteed government contracts, maximum productivity translates into maximum financial return. It can also can play an important role in customer public relations strategy since it includes user-friendly dashboards that tabulate solar system energy production and the energy savings derived from solar generation. And, the dashboards can be installed on building lobby kiosks, or on company Facebook or web pages to help promote the solar projects to the public.

The system also analyzes greenhouse gas emission reductions resulting from the solar power generation based on standard calculations from the U.S. Department of Energy. Moreover, this information can be communicated to the public to emphasize the company's commitment to environmental stewardship. Among the many benefits this monitoring approach provides are operations and maintenance efficiency, long-term technology evaluation, and validation of the asset investment.

ABOUT THE AUTHOR

Tom Crawford is Senior Manager and a member of the Capgemini - Global Smart Energy Services team. He has 35 years of utility industry experience with a strong focus in smart grid, utility distribution operations and field operations. Tom's electrical utility background and leadership in distribution automation, smart meter and smart grid initiatives have provided him with the expertise in advising utility clients, worldwide on business and technology solutions including utility business process design and change management, distribution automation, outage management and customer communications, utility emergency management, PHEV, EV and EV Infrastructure, solar technology, work force automation and mobile IT.

THE BIGGER PICTURE

VOL 3 NO. 4

BY GREGORY K. LAWRENCE, PARTNER
CADWALADER, WICKERSHAM & TAFT LLP

Headwinds, but Stronger Tailwinds for Renewable Transmission Projects: FERC Takes Action

The Federal cash grant program for renewable projects expires at year's end. Adding to this perceived financing gap, conventional wisdom describes a perceived dearth of "traditional" tax equity investors for these projects. Yet despite the present headwinds for renewable projects, a renewed tailwind for renewable energy may also be gathering momentum…

Some existing investors – and importantly, new entrants – continue to offer lower-cost financing in exchange for federal and state tax credits and accelerated depreciation under pre-cash grant tax credit rules and familiar financing structures. Adding to this momentum, since May 2011, the Federal Energy Regulatory Commission (FERC) has taken significant steps aimed at developing a transmission grid infrastructure capable of supporting renewable project development in the United States. In May of this year, FERC approved another generous incentive package to encourage private investment in the Atlantic Wind Connection (AWC) project and accelerated review of the expansion of such incentives to spur new transmission projects. FERC followed up in July by approving comprehensive cost allocation regulations for new transmission projects.

Following similar renewable transmission incentive orders, on May 19, 2011, FERC granted important incentives to AWC – a $5 billion project – which if completed, will consist of a 250-mile offshore transmission grid capable of flowing up to 7000 megawatts of electricity along the Eastern seaboard, including offshore wind power. AWC is a joint venture among Google Inc., Good Energies, the Marubeni Corporation, and Trans-Elect Development Company, LLC to build an offshore "backbone" electric transmission system from Virginia to New York City. Smaller lines will connect the "backbone" to the onshore transmission grid and load in the states along its path.

FERC granted AWC a significant incentives package aimed at investors who might otherwise be deterred by the high risks associated with developing an innovative renewable transmission project. FERC approved a 250 base points adder to AWC's return on equity (ROE) with a total overall ROE of 12.59%. AWC will also be able to include 100 percent of the costs associated with construction work in progress in its rate base. And add to that the approval of 100 percent of AWC's prudently incurred costs should the project fail for any reason deemed outside of the sponsors' control. These specific incentives are helpful because, under general ratemaking principles, costs are not included in rates unless demonstrated to be prudent, used and useful (meaning the asset actually is providing the contemplated service). FERC also authorized a hypothetical capital structure based on 60 percent equity and 40 percent debt – generous for an initial capitalization.

As a pre-construction package, these are critical incentives encouraging investment by limiting potential risk incurred by investors if the project fails. AWC must receive approval under the PJM Interconnection transmission planning process and be included in PJM's regional transmission expansion plan before the incentives take effect.

On the same day FERC approved the AWC incentives package, FERC also issued a Notice of Inquiry ("NOI") seeking stakeholder comments on further implementation of FERC's transmission incentives, including for renewable transmission projects. The NOI comes roughly five years after FERC issued Order No. 679, implementing Section 219 of the Federal Power Act, with the goal of promoting investment in transmission projects, and the provision of reliable and lower cost power for consumers, by reforming certain long-held transmission development models.

Under Order Nos. 679 *et al*, FERC encourages and has granted transmission incentives if the transmission project can demonstrate that it either ensures reliability or otherwise reduces congestion and related costs. There is a rebuttable presumption that the project meets this reliability/congestion reduction test if the project is found acceptable as part of a regional planning or state siting process that evaluates projects for reliability and/or congestion reduction.

The project, moreover, must show a nexus between the package of incentives sought and the nature of the investment being made, including the scope, risk and challenges faced by the project. Importantly, FERC has in certain cases interpreted these conditions broadly.

FERC has allowed incentives to transmission projects that may not directly relieve congestion or meet a specific reliability need but, instead, provide the infrastructure to meet state renewable energy standards and to serve load growth reliably. Incentive packages, akin to AWC's, include ROE adders, abandonment cost recovery, 100% CWIP, development and accelerated depreciation rate base recovery, and a hypothetical capital structure at the project's inception.

Now, after five years of experience, FERC seeks stakeholder comments regarding the implementation of the next phase of transmission project incentives. FERC is gathering comments regarding its continued efforts to encourage transmission development, while balancing its open access, reliability, efficiency and equitable rate policies. FERC requested stakeholders to address:

- Incentives best suited to address transmission developers' obstacles;
- Potential improvements to the cost estimate process;
- Nexus requirement track-record to date and suggestions for improvement;
- Additional incentives; and
- FERC's considerations when an applicant cannot meet the rebuttable presumption that its project will either ensure reliability or reduce transmission congestion.

Parties have filed comments ranging from strong support for the incentive program (as implemented) to opposition. Some oppose transmission incentives for large-scale transmission projects in favor of incentives for small-scale localized distributed generation and micro-grid projects. Others suggested offering incentives tied to successful completion of project milestones.

Then, on July 21st, FERC continued the summer trend, when it unanimously adopted its final rule on Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities ("Order No. 1000"). Order No. 1000 follows a rulemaking that commenced in June 2010 and generally reforms transmission planning, cost allocation methods, and non-incumbent developer rules.

The rule requires each public utility transmission provider to participate in a regional transmission planning process that satisfies the requirements set out in FERC Order No. 890, including regional transmission planning. Each planning process at the local and regional level must consider transmission needs driven by federal or state statutes, regulations and policies, including renewable energy requirements. Moreover, each such transmission provider must coordinate with neighboring transmission-planning regions. Notably, each transmission provider must also participate in a regional transmission planning process that has a regional cost allocation method for new transmission facilities satisfying certain regional cost allocation principles. The rule also attempts to even the playing field between public utility incumbent and non-incumbent projects including the right of first refusal and right to construct and own facilities sponsored in a regional transmission planning process.

Renewable energy proponents continue to praise Order 1000 as an ambitious FERC action to encourage development of renewable energy projects. They are encouraged because Order 1000 will eliminate the first right of refusals and preferences over new transmission projects previously held by large, established incumbents with fossil fuel projects. Order 1000 also requires transmission planners to account for individual state renewable energy requirements (and other government policies aimed at encouraging renewable development) when considering new transmission projects. Renewable advocates also believe Order 1000 will benefit their projects by increasing access to information about the transmission planning and access process.

The order will go into effect October 11, 2011 and public utility transmission providers are required to make a compliance filing next year. The final rule does not specify a uniform approach for compliance leaving implementation details and impacts for the compliance filings.

The forecast: Headwinds, yes. But possibly stronger tailwinds, driven by ambitious regulatory policy and new market entrants going forward. Stay tuned for further developments…

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Volume 7 No. 2

With William T. (Tim) Shaw
PhD, CISSP

SECURITY SESSIONS

All automation systems are not created equal

Welcome to this installment of Security Sessions, a regular feature focused on security-related issues, policies and procedures. Computer-based industrial automation systems, including both SCADA and DCS varieties, entered the market in the 1970s and there have been several subsequent evolutionary step-changes in the technology base since. Unlike the world of office automation and IT the systems put into operation in industrial facilities have always been expected to have extremely long lifetimes; in the range of 20 to 30 years. That means that you could expect to find members of the last few generations still busily blinking their LEDs and monitoring and controlling processes even today. In fact in the last few years I have come across examples of the first generation of such systems still in operation. When we speak of industrial automation cyber security very few individuals actually make the distinction between those older systems and the ones being sold today. So I thought it might be useful to do so – ***Tim***.

When you hear most cyber security experts discussing how to achieve adequate cyber security and the threats and vulnerabilities that have to be addressed, you come away with two basic impressions: First, that they are focused on typical corporate IT systems and not concerned with – or even aware of – the differences between those systems and the 'typical' (if there is such a thing) process/plant automation systems; and second, that they expect all computer systems to be of a recent, current vintage and technology. Nobody ever seems to talk about the 'old' systems because they assume such systems would have been upgraded or replaced long ago.

Even when people do acknowledge these older legacy systems it is as if they are not just old but actually ancient, and ancient doesn't have to be considered for cyber security since those systems were obviously built with vacuum tubes, transistors the size of golf balls and electromechanical relays, so they can't be doing anything important – even if they are still in operation. Well, that may be partially true, but the more complete truth is that the world of automation – and a lot of our industrial plants – are still making use of systems that were commissioned in a year that was one, two, three, or possibly even four decades ago. And surprisingly, those legacy systems may actually be monitoring and/or controlling something quite critical. So, maybe we DO need to think about them from a cyber security standpoint after all. Ah, I feel better much for having gotten that off my chest, so now we can move on…

Let's start by reviewing our recent 'ancient' history. In the 1970s supervisory control systems, including both in-plant and geographically-distributed systems, became much more prevalent due to the introduction of (relatively) low-cost, 16-bit minicomputers from companies like Digital Equipment Corporation, Hewlett-Packard, Varian, Xerox, Data General and others. Those systems tended to be centralized and mostly used for in-plant data acquisition and supervisory control, which would later become known as SCADA – supervisory control data acquisition. Those systems comprise what I would call the first wave of computer-based automation, many of which remain in service today.

These older systems are not likely to be attacked in the conventional manner we fear today – i.e., attacks coming across the Internet from a malicious nation state – because they did not support TCP/IP networking. On the other hand, a lot of them supported dial-in telephone modem connections that would permit an external attack if such telephone connections were still operational. Believe it or not, hackers still look for phone line connectivity and modems that answer when dialed. If they occasionally stumble across one of these older systems they might not know what they had found, but just by trying a lot of commands and typing random key sequences they might be able to cause a system lockup or failure.

The next generation of computer-based automation systems came to the forefront in the 1980s with the introduction of 32-bit super-minicomputers as well as the growing use of 8- and 16-bit microprocessors as components in remote terminal units (RTUs) and in-plant data acquisition and control units, which were increasingly becoming programmable logic controllers (PLCs). These systems may well have employed Ethernet I – so called 'DIX' Ethernet – as a local area network and may have supported some level of networking (such as Digital's DECnet or IBM's SNA.) Again, I've seen these systems in operation as recently as this past year. And, as with the prior generation, these systems were likely to have supported dial-in telephone modem connections, which would permit an external attack for as long as the telephone connections remained operational.

If a malicious individual found one of these systems it is quite probable that they would have some level of success communicating with the operating system as by this time operating system command line interpreters (think Microsoft's DOS) were getting more commonplace and standardized. Depending on the computer manufacturer (and age of the hacker), they might even recognize the operating system by its responses, which could readily lead to a more serious compromise than merely shutting the system down or causing it to crash.

The third generation of computer-based automation made its debut in the 1990s and made use of TCP/IP networking, Ethernet II (usually at 10 Mbps speeds) and early versions of Microsoft Windows running on microprocessor-based PCs as well as RISC-based workstations running UNIX operating systems. This range of systems might have had a direct connection to a corporate network for data exchange with business applications (and thus, eventually to the Internet) and/or they may have supported remote dial-in (using SLIP or PPP connectivity) with X-Window access so that the plant engineering staff could access the systems remotely and make adjustments without having to physically travel to the plant. At that time, it was also becoming much more common to support connectivity over the Internet for remote vendor support and maintenance.

Systems like these might also be susceptible to discovery and attack using either/both telephone or Internet pathways. Moreover, their operating systems would be familiar to most hackers. Hijacking an X-Window session would allow an attacker to see the same operational graphic screens as the plant operators, which offers a range of dangerous actions. Again, these systems are still in extensive use and are definitely at risk of cyber attack, particularly since none of them were ever built with any deliberate cyber defenses. Worse yet, their vendor support probably dried up a while back, so patches or updates are probably no longer forthcoming, putting these systems increasingly at risk.

The fourth (and current) generation of computer-based automation came out between the last decade of the last century and first few years of the 21st. These systems make extensive use of Microsoft Windows-based PCs and servers with X86 microprocessor architectures, using switched high-speed (100 or 1000 Mbps) Ethernet-TCP/IP networking, employ well known IP-based protocols, incorporate a diversity of commercial software and database products, and may even apply various web technologies to their operator HMIs. Most of these systems are probably still actively supported by their vendors, may (or may not) be patched and updated as security vulnerabilities are discovered, and are almost always attached to networks that eventually lead to the Internet.

These contemporary (i.e., 4th generation and beyond) systems are the ones that most cyber security professionals are thinking about when they discuss industrial automation vulnerabilities and are are the easiest for a modern cyber attacker to understand and attack because they are built on the technologies (i.e., hardware platforms, networking architectures, operating systems, etc.) that hackers are most likely to recognize. It is assumed that these systems have the greatest vulnerability to cyber attack, unless adequately defended with a full range of both technical and administrative countermeasures.

I would agree that in general, the oldest computer-based automation systems (first and second generation) are fewer in number and are actually relatively easy to defend, which is something that good operational and maintenance procedures can easily address – provided you keep those phone lines disconnected, of course! Just don't presume that you don't have any systems of that vintage or that, if you did, there is no way to attack them. In performing plant security assessments and vulnerability assessments over the past few years time and time again I come across old computer-based systems sitting in a back room, or locked in a cabinet that hasn't been opened in years, and find active phone lines or network connections that aren't even documented.

In most cases these old systems are chugging along, and no one touches them for fear of causing them to fail because finding someone who how to fix them or where to find spare parts can be quite problematic. Even so, it is assumed that they must be doing something useful or they would have been turned off and tossed out years ago. And yet, because of their vintage, no one thinks about their vulnerability very much. When I ask, I often get responses like: "…what, that old system? No one could/would want to attack that old thing…" Unfortunately, that kind of response usually means that it's off their cyber security radar – a hackers dream!

The not-quite-so-old computer automation systems of the 1990s present a bigger challenge since they might have network connectivity and use TCP/IP protocol, and/or phone line connectivity. It is highly unlikely that anything can be done directly to improve their cyber security of these systems due to the absence of vendor support. However, they can still be wrapped in a protective 'cyber cocoon' of operational and maintenance procedures and technical countermeasures, such as firewalls and intrusion-prevention systems. That doesn't often require physical modifications, and fixes can usually be administered without disrupting or impacting system operation. (But again, there are those phone lines, which must all be properly accounted for and secured.

In conclusion, here's the take-away from all of this: Cyber security tends to be focused on obvious communications channels such as LAN and WAN network connections and the fastest growing connectivity of choice, wireless. People tend to forget about phone lines and 'sneakerNet' because they aren't high-tech. Don't forget that sneakerNet was the primary delivery vector used in the Stuxnet attack on Iran's enrichment facilities; probably precisely because people DO tend to forget about defending that pathway.

Remember that older computer-based automation systems are most accessible via these low-tech avenues. If you still have legacy computer systems that you depend upon, you really need to think about protecting them from potential cyber attackers just as you would any new systems you install. In fact, protecting those older systems is actually much easier than protecting a modern one in most cases. But that will have to be the topic for a future column… ***Tim***.

ABOUT THE AUTHOR

Dr. Shaw is a Certified Information Systems Security Professional (CISSP) and has been active in industrial automation for more than 35 years. He is the author of Computer Control of BATCH Processes and CYBERSECURITY for SCADA Systems. Shaw is a prolific writer of papers and articles on a wide range of technical topics, has contributed to several other books, and teaches several courses for the ISA. He is currently Principal & Senior Consultant for Cyber SECurity Consulting, a consultancy practice focused on industrial automation security and technologies. Inquiries, comments or questions regarding the contents of this column and/or other security-related topics can be emailed to tim@electricenergyonline.com.

Does it make you Nervous when Machines Talk to Each Other?

Helping Consumers Face Smart Grid Fears in a Brave New Energy World

By Patty Durand, Smart Grid Consumer Collaborative

> *"The Internet of Things (IoT) refers to the vision that in the next twenty years, a revolution in device-to-device communication will take place that will be comparable to the revolution in person-to-person communication that erupted in the last two decades with the Internet and World Wide Web. We believe the vision is credible – that the second revolution will in fact occur and is already beginning before our eyes."*
>
> – Robert Saracco
> IEEE Time Machine (May 2011)

If you are an engineer, the vision described above may excite you, although it will likely not surprise you. You are familiar with (may have even helped develop) advanced technologies in automation and communications that support our ever-smartening electric grid.

However, if you are a layperson, the vision of an increasingly computerized future may startle and even frighten you.

Smart grid characteristics like increasing automation and centralization of supervisory capacity – or alternatively, the distribution of intelligent controls making them ubiquitous – can provoke a variety of fears among consumers. Some concerns are quite reasonable; some may be rooted in ignorance or misconceptions; others are almost primal.

Consumer Engagement 101

To address consumer concerns, smart grid stakeholders of all kinds will need to:

1. recognize and sort through concerns consumers may have;
2. acknowledge and explain the risks; and
3. communicate the benefits of smart grid technologies.

If we want consumer support, we must give them the tools – including the information to put the whole picture into perspective – to play the role of energy partners that the 21st century grid demands. In many cases, this is going to mean allowing greater transparency into utility infrastructure investments and exploring new ways to expand consumer access to information – increasing consumer touch points and human interaction to balance increased automation.

Acknowledge Reasonable Concerns

It is not alarmist, but prudent, to examine the potential for increased vulnerability that smart grid innovation could bring. It's not a bad start to simply acknowledge that consumers deserve answers to items they anticipate could expose them or the grid to risk. What used to be a 'poles, wires and power' business, is about to become a 'customer relations-energy communications' industry. These issues, along with the duty to provide safe and reliable power, are intrinsic to this work. While it is sometimes not acknowledged as often as deserved, electric utilities across the United States do a spectacular job routinely meeting demand and making affordable power widely available. Now we need to stay humble and learn how to talk about what we do and about the challenges we face *that we cannot address without consumer support*.

Privacy

A prime example of a reasonable concern – but one that can also provoke significant controversy – is privacy. As a baseline, every utility must provide a communications plan that includes (1) listening to the local community's values regarding who will own and share personal data and (2) outlining what additional safeguards the utility has embraced or enabled along with their smart grid programs and (3) conveying any options consumers may avail themselves of to manage their energy information.

Security

Inherent in the American character (and written into our founding documents) is a healthy dose of distrust of a too-powerful government. In the modern era, these misgivings extend to the potential for too-powerful commercial entities as well. No smart grid vision can fail to examine and take into account the widespread consumer impulse to safeguard ourselves as much as possible from security scenarios that could be exploited.

While, like privacy, the issue of security can provoke significant controversy, it is also foundational to smart grid success to clearly acknowledge the potential risks of shared infrastructure. Deliberate physical or cyber abuse by a government entity (our own or a malicious rogue state), by corporations, hackers, or terrorists; accidental breaches by natural disasters, simple accidents, interference by wildlife, structural depreciation in aging infrastructure, neglect, and human error are all potential sources of vulnerability that may concern consumers. Several utilities have excelled at demonstrating their recognition of these needs, without revealing excessive details of their security measures.

A utility's ability to tread this fine line, as noted above, may require a reassessment of whether or not past communications and business dealings have been fully transparent and truthful. Consumers need a consistent record of good faith and responsible behavior and are reasonable in expecting accountability from those who (literally) hold the reins of power in their communities. If changes are needed, this too is an opportunity to improve future consumer support by acknowledging and addressing areas for improvement.

Health and Environmental Impacts

Our world is changing. Radio frequencies and electromagnetic fields penetrate more of our living space. Increasing concern for carbon dioxide emissions is driving a re-examination of energy sources. Consumer concerns can play a useful role in both identifying and reminding energy industry professionals of the public safety priorities they share.

Utilities' best interests in the long run are served by joining the conversation and making choices that will support society through responsible and healthy energy programs. Because those in the energy and communications fields are among those with the best understanding of the benefits of these technologies, they are ideally positioned to provide a balanced perspective of the risks and benefits of smart grid programs.

Misconceptions and Primal Fears

Despotic Automation

We've all seen those movies where robots take over the world and enslave humans. They're good entertainment. Perhaps they fascinate us by exaggerating our human fears about the power of our own creations or the impact of unintended consequences. Without a balancing consideration of the benefits of technology, fear of technology can distort consumer attitudes to the concept of mass-deployed automation and advanced controls on our power grid. While few would suggest that smart grid could spawn some sort of "rise of the machines" post apocalyptic threat, utilities can ratchet down general anxiety about the increasing role of technology in our world by helping consumers understand it better.

We can explore simple ways to increase consumer understanding of the scope, uses, and limits of technology already helping in their community. For example, while few consumers open their bills looking to learn more about transmission and distribution, many might be pleased to learn that automation software already on their lines (thanks to utility investment in their community) helped prevent or restore outages in their neighborhood after the last thunderstorm. It's time to learn how to share the benefits automation has already brought to consumers.

Consumer concerns about an increasingly automated world may be best addressed by both citing the improvements to reliability that have come from automation and at the same time conveying to consumers the ways that human engagement – with its redeeming capacity for common sense, intuitive and compassionate judgment, and imaginative problem-solving (among other qualities) – is still present in control rooms.

Does it make you Nervous when Machines Talk to Each Other?

Helping Consumers Face Smart Grid Fears in a Brave New Energy World

Centralization & Distribution

These aspects of an automated grid can benefit from similarly creative efforts to enhance consumer understanding and acceptance by educating them to the beneficial uses they already enjoy.

Risks/Benefits Analysis Needed

Like any interaction in modern society, smart grid brings risks and benefits. Sharing with consumers the industry's sincere desire – and revealing its motivations and incentives – to balance these two factors will be an important task. Smart grid stakeholders need to lead the charge to engage consumers as never before and to educate and lend perspective to inform consumer participation in the energy process.

Energy Industry as Advocates

Along with the realization that automation is beginning to affect electric consumers and to require their financial support, cooperation, and energy use habits, the industry at large has been realizing a new era of consumer engagement is upon us.

The Smart Grid Consumer Collaborative (SGCC), which formed in early 2010, seeks to meet that need. Made up of over 70 members from regulatory, utility, technology vendors, and environmental and consumer advocacy groups, the group pools member resources to fund valuable research. In January 2011, SGCC published the "2011 State of the Smart Grid Consumer Report", a meta-analysis of more than 80 industry source documents, providing a valuable baseline view into the industry's current understanding of consumer engagement. SGCC will be addressing other knowledge gaps identified by its members through two new 2011 studies, *Smart Grid Consumer Pulse and Excellence in Customer Engagement*, available October and November 2011.

Educating the Masses

Ignorance drives fear; therefore, knowledge drives it out. As utilities consider their task to inform consumers, it is also useful to examine the flipside of this equation: What might the industry fear about consumers? Industry stakeholders can arm themselves for positive consumer engagement with information from SGCC resources. Sharing success stories, developing best practices, joining private monthly conference calls to debate or problem solve, gaining peer support and facilitating cross-stakeholder discussion are exciting new opportunities being embraced by an industry increasingly aware of the need to engage consumers.

ABOUT THE AUTHOR

Patty Durand is executive director of the Smart Grid Consumer Collaborative, a consumer focused nonprofit aiming to promote the understanding and benefits of modernized electrical systems among all stakeholders in the United States. Durand's prior experience includes smart grid research at Georgia Tech, and she is the past director for the Georgia Chapter of the Sierra Club, focused on climate change and energy policy. She also serves on the board of the Smart Grid Society for the Technology Association of Georgia. Durand earned a master's degree in business administration from the College of William and Mary in Williamsburg, Va., and a bachelor's degree from Virginia Commonwealth University.

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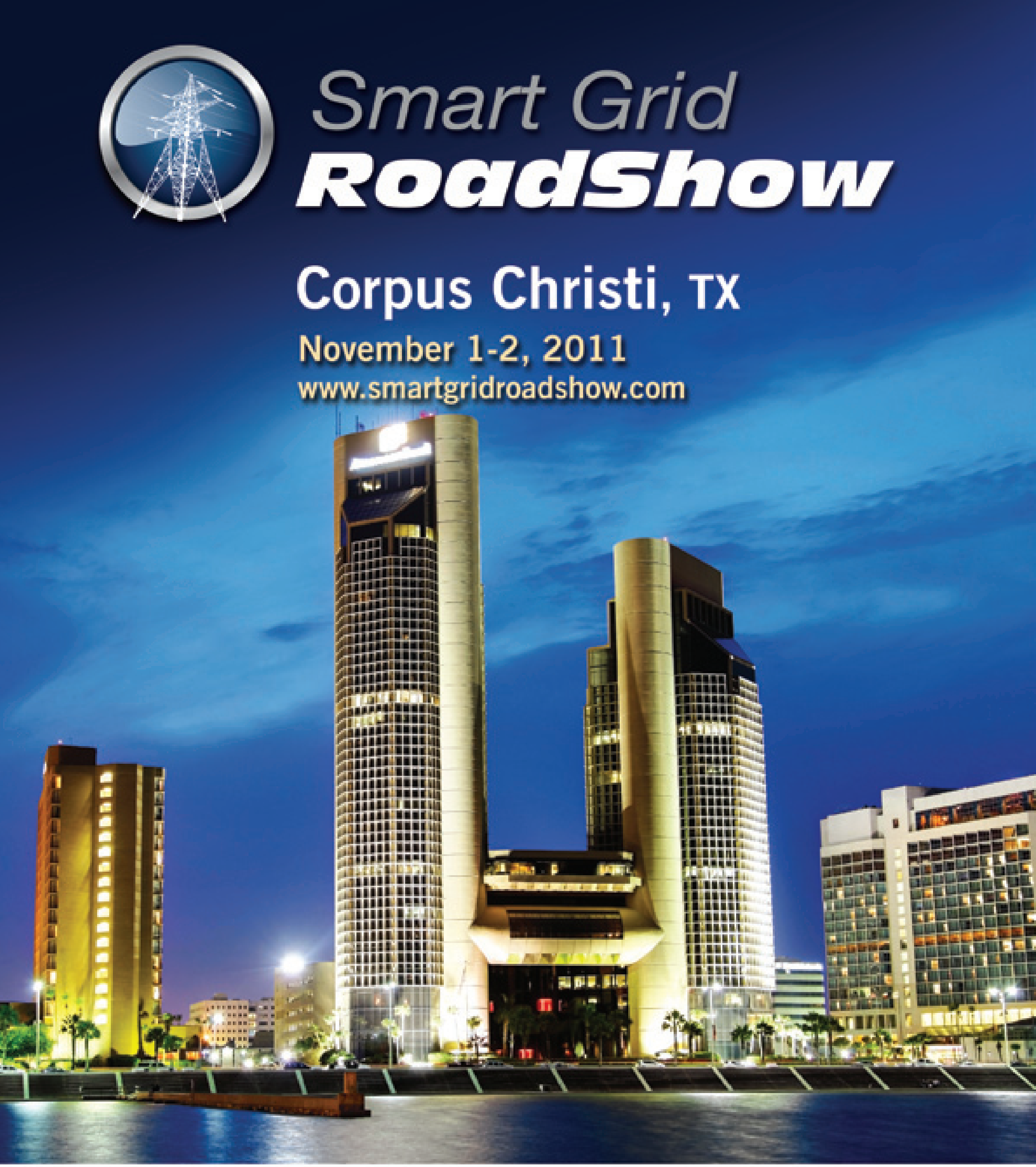

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