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MAY-JUNE 2010 Issue 4 • Volume 14

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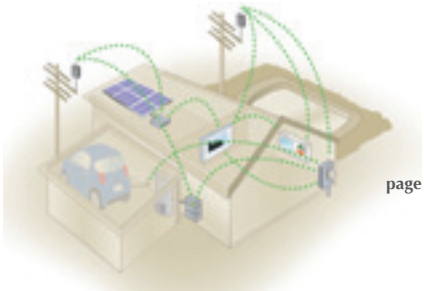
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SENSUS

The Measure of the Future

Michael A. Marullo, Editor in Chief

BABI Boom!

No, my spell checker hasn't gone haywire (or is it "haywire-less" now?). In this case, I'm just using a play on words to bring your attention to something that I think is going to give that other Baby Boom a run for its money. What I'm referring to is the rapidly rising level of interest and opportunities in BA (Business Analytics) and BI (Business Intelligence).

Some of you may consider these terms – BA and BI – interchangeable, but I see them as having subtle differences. I like to think of them this way: If you do BA correctly, it will lead to BI – rather than the other way around. Maybe it's just my research mentality that tells me you must perform *analysis* (on the data) to derive *information*. We may disagree on that point, but bear with me on this for a bit...

Even before one reaches the BA phase, it seems to me that there's an implicit data acquisition step in there that must be satisfied. Then, once you've gathered some useful data you can do the analysis – and provided you do that correctly – the output is Business Intelligence. In other words, BA is the "cause" that drives BI, and BI is the "effect."

But the real point I want to make is that we have a process – BA to BI – that can be applied to at least three areas of the utility enterprise right away. Perhaps the most prominent and most familiar of these is the burgeoning AMI (Advanced Metering Infrastructure) arena and the data repository that has spawned this new (okay, not new, but drastically redefined!) area we commonly refer to as Meter Data Management – or simply MDM – which could also be interpreted as Millions of Daily Measurements!

This isn't the first time around for this sort of thing by any means, but one could argue that it's probably the most intensive data processing task we've seen since the so called Y2K (Year 2000) run-up – at least for something that applies broadly across the utility industry landscape. But MDM is only one piece of what I see as drivers for this BABI Boom.

Another piece is something we often refer to as "non-operational data." This generic term refers the mounting volumes of data being collected and stored by substation devices – mainly relays – that provide an inside glimpse of what's going on at the substation, aside from the "operational" aspects, that is. To be sure, we keep close track of supervisory control and data acquisition (SCADA) operations such as tripping/resetting breakers, changing transformer settings, reconfiguring switches and the like – all pretty much in real time. That information is recorded on the outbound side of communicating devices, and the results of those control actions are brought back with every scan – once per second in most cases.

But that's only a fraction of the data that's being gathered and stored locally (i.e., at the substation). Oscillography pertaining to various aspects of power quality; analytical data around sequence of events; alarm data, device operating durations, and the number of operations of a particular device are all stored and waiting for someone to access this valuable information for reliability analysis and a host of other purposes. We're not talking just a few megabytes of data here – these are huge volumes in many cases... easily petabytes, over time!

So why hasn't this data been harvested previously, you might wonder? Mainly because of insufficient communications bandwidth, which brings us to another trend that I'll address in a minute. But for now, let it suffice to say that the problem is rooted in outdated, outmoded real-time communications networks that are only recently catching up with the times.

As most SCADA engineers are painfully aware, a huge portion of the mission-critical communications that we depend on for these systems to function properly is still operating in the 1200- to 2400-baud (bits-per-second) range, often dictating dedicated lines to each and every substation RTU (remote terminal unit). Just bringing back the critical operational data consumes all of the available bandwidth, leaving a treasure trove of non-operational data stranded in remote storage silos with essentially no way to access without disrupting or derailing the most vital real-time data exchanges.

The third – and potentially the most prolific and diverse – database is one that only barely exists today. Perhaps you've come across the terms/phrases, "ubiquitous data acquisition," or maybe "grid sensors" in recent readings or conversations? These refer to a whole new genre of data gathering; one where it is not only feasible and economical to gather single points of data over a broad geographical area, but also where the data types can be widely diverse with sample rates that are measured in months or years, rather than the usual minutes or seconds.

I won't get into the vast and rapidly unfolding details here, but we are talking about potentially millions of points that measure everything from atmospheric conditions and the conductivity of soil to specialized alarm detection and surveillance of areas and/or devices that have been previously a purely manual task. Part of the solution set is new micro- and nano-technology, but the other key piece is the adoption and proliferation of less expensive communications systems (notably RF mesh, as compared to conventional wired and wireless alternatives) that are both inexpensive to buy and deploy as well as easy to configure and maintain for these specific purposes.

Once these giant data repositories are created, the next challenge will be getting from the BA phase to the BI phase. My view is that first we will see a protracted analysis phase (currently underway) to explore these data mines and determine what is feasible. Then, once we have an idea of the possibilities, we will begin to see a rapid transformation from raw data into valuable information. Who will be first and who will do it best when it comes to exploiting the BABI Boom? Well, that remains to be seen. – ***Ed.***

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PG&E Provides Detailed Reports on SmartMeter™ Program, Announces Further Steps to Address Customer Questions

Move Gives Public Full Access to Data PG&E Provides to California Utility Regulators

Pacific Gas and Electric Company (PG&E) released forty-five reports, dating back to August 2006, that provide a detailed look inside the company's SmartMeter™ program. No other utility in California is reporting on its meter conversion program as often or in as much detail. The reports are located on PG&E's website at *www.pge.com/SmartMeterCPUCreports*.

PG&E has been providing these reports to the California Public Utilities Commission (CPUC), as well as the Division of Ratepayer Advocates (an independent division of the Commission that advocates on behalf of customers), since the beginning of PG&E's SmartMeter™ program.

"We welcome the opportunity to share these reports publicly," said PG&E Senior Vice President and Chief Customer Officer Helen Burt. "Presented in detail, the information here reaffirms the facts we previously outlined for customers: that more than 99 percent of the SmartMeter™ devices we have installed are performing exactly as designed. This is a success rate that represents a significant advance over traditional meter technology, delivering more accurate bills to our customers along with more detailed information about their energy use."

Burt added, "The reports also show that PG&E has been frank, forthright and proactive with regulators and ratepayer advocates about our progress and challenges, and has made painstaking efforts to ensure this technology performs the way we and our customers expect it to."

Presented in the documents are data pertaining to early reviews, monitoring, testing and corrections identified and applied throughout the program, in most cases before the issues could affect our customers or their bills. Included in the information are "risk tables" showing that, as part of its implementation efforts, the company took steps to think through and address a wide range of potential issues that could arise. Also included are "mitigation tables" that show prudent steps the company took to identify, plan for and manage these potential issues.

In the reports, PG&E identified 137 unique risks and issues over a 4-year period. Of the 118 that required specific action plans for resolution, 107 have been resolved. Four of those issues impacted customer bills, and PG&E identified those last month as involving wireless communications, data storage, meter installation and meter accuracy.

PG&E's SmartMeter™ program is part of a statewide effort approved by the CPUC to upgrade California's energy infrastructure with automated metering technology. This technology is the cornerstone of the Smart Grid that will modernize the electric system to be stronger, smarter and more efficient. The SmartMeter™ program is also essential to encouraging growth in renewable energy sources, laying the foundation for a low-carbon economy and empowering consumers to understand and reduce their energy use and monthly costs. The overall program budget and rollout timeline, set in 2005, remains on target. PG&E continues to seek additional program efficiencies to stay on, or improve, this track.

"We have confidence in this technology and in our program," said Burt. "At the same time, we recognize that some customers question whether they can have faith in our SmartMeter™ program, and frankly in PG&E. Restoring this trust is absolutely critical to us. We also know that we've let some of our customers down with the quality of customer service they received. While 99 percent of our SmartMeter™ devices are installed and working properly, we recognize that even having less than 1 percent of meters with issues is still 50,000 customers, and that's too many."

"Today, we are renewing our commitment to our customers," Burt added. "We pledge to address customer service issues better than we have been, more quickly, and more aggressively."

Specifically, the company is now:

- Expanding its recently announced side-by-side meter testing program, doubling the number from 150 homes to 300 homes.
- Increasing the number of its customer Answer Centers, the latest of which is in Oakland, so customers can have one-on-one service to address their questions and concerns.
- Using a dedicated SmartMeter™ customer call center to ensure specialized and expedited handling of customers' questions and concerns regarding SmartMeter™ devices.

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Industry NEWS

- Adding 165 additional customer service representatives to improve customer service and help customers with billing.
- Revamping customer communications around the installation of SmartMeter™ devices, including a series of communications timed to introduce customers to their newly installed meter and its benefits.
- Communicating with customers multiple times, and in multiple ways, about their new SmartMeter™ device and how it can empower them to control and reduce their energy use.
- Calling all customers who receive an estimated bill for two billing cycles, to explain the reasons for the bill estimate and facilitate payment arrangements.

PG&E also pledged to provide weekly updates on its SmartMeter™ program, including milestones or key developments as they happen, and to post on its website the results of side-by-side meter testing data. *www.pge.com*

Circle **16** on Reader Service Card

ABB acquires Ventyx to strengthen its network management business

Acquisition positions ABB as a key player in energy management software and smart grids

ABB, the global power and automation technology group, has agreed to acquire Ventyx for more than $1 billion from Vista Equity Partners to become a leading provider of software solutions for managing energy networks.

Ventyx, based in Atlanta, Georgia, is a leading software provider to global energy, utility, communications, and other asset-intensive businesses, offering a broad range of solutions including: asset management, mobile workforce management, energy trading and risk management, energy operations and energy analytics. The company also provides software solutions for planning and forecasting electricity needs, including renewables.

ABB will combine its related network management business within the Power Systems division, with Ventyx to form a single unit for energy management software solutions. By providing ABB with broader access to the utility enterprise management market, the acquisition triples the energy management software market available to ABB.

"The big advantage for energy companies, utilities and industrial customers is that they will now have a single supplier of enterprise-wide information technology platforms and power automation systems," said Joe Hogan, ABB's CEO. "The advantage for our shareholders is a cash-generating acquisition in an exciting growth market, with a strong management team, a highly complementary offering and geographic scope, and an attractive return on capital employed."

Ventyx has a large installed base in the US market and Europe and operates in more than 40 countries. Its customers include leading power utilities in the United States and Europe as well as industrial businesses. The company employs 900 people and reported 2009 revenues of about $250 million.

The acquisition is in line with ABB's strategy to pursue growth opportunities that complement the company's product, technology and geographical portfolio. It is subject to customary regulatory approvals, and ABB expects the transaction to be completed in the second quarter. ABB intends to pay for the acquisition in cash.

Combining Ventyx's leading software suite with ABB's systems and unparalleled domain knowledge of the power industry will create a business that is ideally placed to offer solutions that will help to meet the challenges of rapidly evolving energy networks," said Vince Burkett, Ventyx CEO.

One of Ventyx's key software applications gives utilities and grid operators the information they need to better match electricity generation with consumption, even at the household level. By generating real-time information on electricity demand, pricing and availability, Ventyx's software enables a practical business model for utilities to generate revenues from smart grids and carbon trading.

Ventyx's load forecasting software can also help to integrate large amounts of unpredictable renewable energies, such as wind and solar power. The company provides other asset management applications to fully integrate a utility's business and enterprise systems across the entire value chain, and a comprehensive service suite to facilitate efficient resolution of network failures. *www.abb.us*

Circle **17** on Reader Service Card

Sale of Allegheny Energy's Virginia Territory Approved

Co-ops take over service for Potomac Edison customers on June 1 ; Customers assured of smooth, seamless transition

The Virginia State Corporation Commission gave final approval on May 14 allowing Rappahannock and Shenandoah Valley Electric Cooperatives to acquire the Virginia distribution assets of Allegheny Energy, Inc. (NYSE: AYE). Customers in the existing territory of Allegheny's Potomac Edison subsidiary can expect a smooth and seamless transition to service provided by the cooperatives.

"After many months of hard work and planning, both cooperatives are looking forward to providing electric service to our respective new members currently being served by Potomac Edison," said Myron Rummel, President and CEO of Shenandoah Valley Electric Cooperative. "Former Potomac Edison customers can be assured that they will receive the same safe, reliable and affordable power that current members of both cooperatives have enjoyed for generations."

"I appreciate the time and effort that the State Corporation Commission invested in reviewing and approving this acquisition," noted Kent D. Farmer, President and CEO of Rappahannock Electric Cooperative. "We look forward to getting to know our new member-owners and are committed to making the transition to the cooperatives as smooth as possible."

"We're pleased by the Commission's decision," said Rodney L. Dickens, President, Allegheny Power. "We will continue to work with the Commission and the cooperatives to finalize the sale and make the transition as smooth as possible for our customers."

Last month, Potomac Edison joined Rappahannock and Shenandoah Valley Electric Cooperatives, the Virginia Office of the Attorney General (Division of Consumer Counsel) and the Frederick County Board of Supervisors in filing a settlement agreement with the Commission. Terms of the settlement were detailed in a joint Allegheny-cooperative news release dated April 28, 2010.

May 14's Virginia Commission order is the final regulatory approval required for completion of the transaction. Allegheny and the cooperatives anticipate closing the sale by June 1.

Both cooperatives will be contacting Potomac Edison customers in the near future with information concerning the transition and any changes they might see as members of one of the cooperatives. In addition, both cooperatives have prominently placed information about the transition on their websites for customers seeking immediate information.

About Shenandoah Valley and Rappahannock Electric Cooperatives

Both Shenandoah Valley and Rappahannock are member-owned, not-for-profit utilities. A board of directors elected by its respective consumers governs each cooperative, thereby giving member/owners a voice in the leadership of the cooperatives. All profits are allocated back to the member/owners based on patronage.

Shenandoah Valley Electric Cooperative will maintain over 7,600 miles of electric lines and will serve more than 89,000 consumers in the Virginia counties of Augusta, Clarke, Frederick, Highland, Page, Rockingham, Shenandoah and Warren, and Hardy County in West Virginia. For additional information about SVEC, please visit our webpage at *www.svec.coop*.

Rappahannock Electric Cooperative will now provide electric service to over 150,000 connections in parts of 21 Virginia counties. With its general office in Fredericksburg, VA, Rappahannock will maintain more than 15,500 miles of power lines through its service area, ranging from the Blue Ridge Mountains to the mouth of the Rappahannock River. For information about REC, please visit our webpage at *www.myrec.coop*.

Circle **18** on Reader Service Card

GUEST EDITORIAL

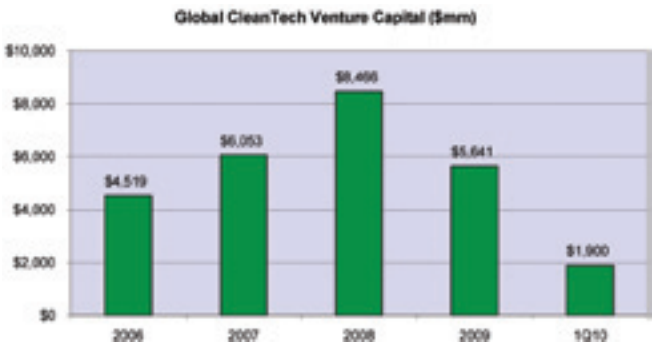
Grid Transformation: Where Investors' Dollars Are Flowing

By Glenn Tofil, Managing Director, England & Company

For most equipment vendors and service providers to the utility industry, 2009 was a year to forget, or at least to look beyond. As a result of an overall slowdown in the economy, credit worries and the short-term "de-stimulating" effect of the American Recovery and Reinvestment Act ("ARRA") of 2009, utility customers pulled in their horns and postponed or slowed plans for deployments of advanced technology. This meant that equipment vendors and service providers spent less time deploying technology and more time building relationships and supporting the stimulus proposals of their customers. For many smaller industry participants that anticipated a ramp in sales from the roll out of "Smart Grid" technologies, it also meant revisiting their capitalization plans and recalibrating investors' growth expectations.

As expected, the confluence of economic events at the end of 2008 and through much of 2009 had an impact on the activity of investors focused on utility and related "cleantech" investments. According to a report recently released by the Cleantech Group, venture investment in cleantech companies dropped by 33% in 2009 to $5.6 billion compared to $8.5 billion of funding in 2008. While the decline is significant, 2008 was clearly a banner year and represented a peak in optimism related to cleantech initiatives across a number of technologies and market verticals. Based on a reported $1.9 billion of funding in the first quarter of 2010, a high level of optimism seems to be returning.

As shown below, there were a number of "megaplays", which dominated the fundraising landscape in 2009. These included financings by companies involved in large scale solar, energy storage, advanced metering and electric vehicles.



Source: Cleantech Group (cleantech.com)

Five Largest Clean Technology Rounds in 2009 ($mm)		
Company	Description	Amount Raised
Solyndra	Thin-film solar (CIGS)	$198.0
A123 Systems	Advanced batteries	$100.0
Landis+Gyr	Smart meters	$100.0
Silver Spring Networks	Smart grid	$100.0
V-Vehicle	Car maker	$100.0

Source: Cleantech Group (cleantech.com)

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Of the $5.6 billion of total cleantech investments made in 2009, the Cleantech Group reported that approximately $1.5 billion in funding went to companies involved in Smart Grid ($414 million) and energy efficiency ($1.1 billion) markets. While the investment in these markets was significant, Project Better Place's $350 million financing announced in January 2010, demonstrates that on a relative basis, areas such as energy storage and electric vehicle technology appear to be the favorites of investors in the near term.

Within utility automation and energy efficiency markets, venture and growth equity investors continued to back seasoned issuers in areas such as home automation/consumer energy management, smart metering and related utility automation technologies. During 2009 and the first quarter of 2010, successful fundraisers included Control4, eMeter, iControl, Landis + Gyr, Silver Spring, Tantalus and Tendril.

While these companies represent a broad cross-section of the market in terms of product or service focus and stage of development and revenue profile, their success in fundraising appears to support the notion that investors prefer companies with significant market opportunity, mass deployable technology and companies with the continuing support of other well-known and highly respected investors.

Despite the success of these companies and relative newcomers on the fundraising scene such as Grid Net and 4Home, a number of well- and lesser-known companies in the utility automation and energy efficiency space remain on the fundraising trail. These include companies in consumer related energy management (hardware and software), advanced metering and demand response, and renewables integration and energy storage technologies. Looking at the number of financial investors with a mandate in these markets and the amount of capital available to them, it is safe to say that there is significant pent up demand for quality investment opportunities. However, despite the pent up demand and increased activity on the part of strategic investors, capital providers remain extremely selective toward financing earlier stage companies and equally as particular in jumping into growth equity investments for more established companies.

During our conversations with investors, concerns regularly expressed include: **1)** the potential for rapid change in the competitive landscape or the market structure (i.e. the emergence of a disruptive technology), **2)** the pace at which utilities are, or are not, embracing new technologies and whether or not issuers are taking that into account in their capitalization and growth plans, and 3) valuation expectations on the part of issuers.

Differing views on valuation certainly ranks as one of, if not, the most important factors in explaining why more financing transactions are not getting done despite the apparent availability of capital and investment opportunities.

Utility Automation and Energy Efficiency Related Financings ($mm)

Date	Company	Description	Amount Raised
April-10	Landis+Gyr AG	Smart meters	$165.0
January-10	Tantalus Systems Corp.	Smart grid communications	$13.4
December-09	Silver Spring Networks	Smart grid hardware and software	$100.0
November-09	Landis+Gyr AG	Smart meters	$100.0
July-09	eMeter Corporation	Smart grid software	$32.0
July-09	Controlit Corporation	Home automation	$17.3
June-09	Tendril Networks, Inc.	Smart grid hardware and software	$30.0
May-09	Controlit Corporation	Home automation	$9.1
March-09	Silver Spring Networks, Inc.	Smart grid hardware and software	$90.0

Source: Company reports and Capital IQ

GUEST EDITORIAL

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The decline in public equity markets during the second half of 2008 and for most of 2009 has no doubt allowed new investors to challenge the valuation expectations of management teams and existing investors that were set during much better times in the public markets. Public valuations for companies in utility automation and energy efficiency markets peaked during the second half of 2007, which coincided with high levels of M & A activity and strong valuations.

The rebound in benchmark valuations and an increase in M & A activity should improve the outlook for issuers in the space. Notwithstanding some of the short-term challenges facing issuers in this market, there is definitely reason to remain bullish regarding their long-term success and ability to secure capital to continue their company building efforts and the growth of the market overall. As previously stated strategic investors are quickly becoming significant players in the space. In addition to the well-established venture arms of electrical and utility products companies such as Siemens and Schneider Electric, leading technology companies such as Cisco, Intel and Google have jumped in with significant commitments of capital in support of utility automation and energy efficiency companies.

Index includes ABB, Badger, Cooper, ESCO, Itron and RuggedCom, Source: Capital IQ

Corporations like ESCO Technologies (parent of Aclara) are making direct investments in technology partners like Firetide. Going forward, we believe that strategic investors will take an even more active role in the market. This increased level of strategic investor activity coupled with the large amount of capital that remains in the hands of financial investors bodes well for issuers as we emerge from the economic and capital markets malaise of 2009. We expect there to be further momentum as utilities become more aggressive in using ARRA dollars and their own balance sheets to pursue deployments of advanced technologies.

About the Author

Glenn Tofil is a Managing Director with England & Company, an investment bank located in Washington, DC. England & Company is one of the leading merger and acquisition advisors to companies and investor groups in energy efficiency and utility automation markets. More information is available at *www.englandco.com*.

The 2010 Automation/IT Leadership Series

Stephan Scholl,
SVP & General Manager

Guerry Waters,
VP Industry Strategy

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"The vision of a 'smart grid' comprises many different concepts – smart metering, demand response, energy efficiency, intelligent outage management and advanced distribution management, just to name a few. Each of these concepts will continue to evolve because the utility industry must and will continue to improve its delivery network and its relationship with customers while providing service at a reasonable cost. Prudent ("smart") business and operational practices will prevail, while expensive fads that do not provide real business or customer value will fall by the wayside." – ***Stephan Scholl***.

EET&D: Gentlemen, I think we can probably all agree that we begin our discussion today at a very interesting point in the evolution of the electric utility industry. By that I mean that there are signs all around us that seem to suggest that when it comes to the grid, the time for hype is over, and it's time to get down to the business of what I prefer to call grid transformation.

In several previous interviews with other industry leaders, we've talked quite a bit about what the future might bring and especially the role of creativity and innovation in bringing our 100-year-old power delivery system into the 21st century. Both the U.S. Department of Energy's *Grid 2030: A National Vision for Electricity's Second 100 Years* – published in July 2003 – and EPRI's *IntelliGrid: Smart Power for the 21st Century*, which followed in 2005, have served as roadmaps to the future for power delivery. But until passage of the American Recovery and Reinvestment Act in 2009 there was relatively little progress toward achieving the objectives set forth by these early grid transformation visions.

Recently we've seen a number of early Smart Grid projects run into problems, however, mainly due to difficulties with public acceptance of smart metering and its associated costs, which I want to quickly point out is but one dimension – albeit a financially significant one – of what grid transformation is ultimately all about. While the jury is still out on most of these projects, it would appear that any notion of just going forward and having ratepayers blindly follow is proving to be more than a little naive.

Now, however, with more than $3 billion in ARRA funding being disbursed all across the country – even as we speak – it seems that there is an implicit call to action. So, with that background, my first question is a simple one, but one that I suspect doesn't have a simple answer: Is there really going to be a Smart Grid, and if so, in what time frame are we likely to see it emerge?

Scholl: The utility industry has been working toward a Smarter Grid for decades, and it will continue to do so. There's no end point because human ingenuity keeps showing us new and better ways to deliver energy. But we are probably close to the so-called "end of the beginning" – a period in which the industry agrees on a set of common goals and objectives.

Waters: One thing that's been key to the first stage of the Smart Grid is the tireless efforts of literally hundreds of suppliers, utilities, and consulting organizations, as well as industry and professional associations, trade groups, and regulatory and governmental bodies around the world. They are providing vital architectural building blocks on which future innovation will rest.

EET&D: The recent efforts of Secretary Chu at the Department of Energy and Secretary Locke at the Commerce Department, in convening the series of meetings orchestrated by the Electric Power Research Institute at the request of and under the supervision of NIST, seem to have effectively accelerated a process that would have otherwise taken several years to achieve under routine circumstances. But even with that boost, what is the latest conventional wisdom regarding a time line?

Scholl: Most industry experts agree we are probably five to ten years out from wide-scale smart grid implementations. However, most utilities are taking steps forward now to address the associated challenges. They're improving information management and analysis, enhancing grid security, boosting revenue, increasing stakeholder value, transforming customer relationships, and more carefully assessing environmental impact. "Smart" utilities will ensure they implement standards-based technologies that integrate with their existing investments; put together plans to manage the exponential growth in data promised by the smart grid; and develop strategies to merge operational, information, and customer technologies.

EET&D: Speaking of integrating and merging technologies, Oracle itself has been through quite a rigorous technology integration exercise over the past few years. Ever since the November 2006 acquisition of SPL WorldGroup, Oracle has been systematically expanding its utility presence and broadening its products and solution sets for this sector. At what point did your utilities business really begin to take shape?

Scholl: Oracle has been serving utilities' database needs for decades. So the company has been a natural partner for utilities as they have embraced new dimensions in middleware. Then came an expansion of that footprint into business software applications. PeopleSoft and JD Edwards, which Oracle acquired simultaneously at the end of 2004, both had a solid presence in the utility business, which continues today. And Oracle E-Business Suite is delivering strong business results among utilities.

The acquisitions of SPL and Lodestar – both providers of mission-critical software unique to the utility industry – were a turning point for Oracle's utility business. The two companies were combined into the Oracle Utilities Global Business Unit so that Oracle could consolidate its utility-specific expertise and better address utilities' specialized needs.

Waters: The SPL acquisition enabled Oracle to offer best-in-class solutions for customer care and billing, mobile workforce management, outage and distribution management, and asset management designed around utilities' unique asset portfolios. Lodestar brought meter data management along with highly targeted applications like quotation management and load profiling and settlement. But what's important about these acquisitions is that today, utility software specialists within the Global Business Unit interact constantly with Oracle's technology, middleware, and business software specialists to help all parts of the utility's IT portfolio evolve together.

Scholl: That point bears repeating. Combining utility-specific applications with technology, middleware, and business software expertise has allowed Oracle to deliver the most complete solution to utilities' operational, business, and technology solutions for investor-owned and public sector utilities. And now, with the acquisition of Sun, we've expanded that footprint into hardware as well.

EET&D: Meter data management was still in its infancy at the time of the Lodestar acquisition, but utilities are increasingly learning that the selection of a suitable MDM solution needs to be made much earlier in the smart metering process than was routinely thought or practiced. Are you finding that more utilities are addressing this challenge sooner rather than later?

Waters: Smart metering is characterized by huge increases in the volume of data utilities must handle and the number of departments and utility business processes that rely on that data. MDM is thus an area where utilities really need to establish a point of control early in the process of architecting the smart grid because so many other things are dependent on the accuracy and validity of those meter readings – creating a correct and timely bill, reducing the number of times repair trucks roll out to service "false alarms," improving the speed and accuracy of outage detection, appropriately sizing equipment in the field, shaving supply costs, and much more. And yes, I think that message is indeed beginning to break through across the utility market landscape.

EET&D: How does one go about establishing and maintaining control of such an enormous amount of data, make sense of it and ensure that it is put to good use – beyond the bill, I mean?

Scholl: MDM is important, of course, but just a beginning. But utilities must establish full control over their data by simplifying their infrastructure and integrating applications in ways that prevent repetition and overlap. Oracle adds applications that provide business intelligence and insight, thus aiding process improvement and increasing customer satisfaction and loyalty. These combined solutions help facilitate utility initiatives to fully address emerging customer needs.

EET&D: Stephan, over the past several years Guerry and I have had several opportunities to talk and compare notes on Smart Grid evolution, but until recently, those conversations have centered almost exclusively on Oracle's software products – primarily those associated with customer information systems, billing and customer care. However, now that Oracle has completed its acquisition of Sun Microsystems, which fundamentally changes the complexion of the company to one with a major hardware presence, a lot of folks see this as a game changer for Oracle. Can you give our readers an idea what impact the Sun hardware presence and asset base is going to have on your utility business?

Scholl: Oracle's Sun products for the energy and utilities industries are extensive and innovative. The acquisition combines best-in-class enterprise software and mission-critical computing systems, enabling Oracle to engineer and deliver an integrated system – applications to disk – where all the pieces fit and work together. Customers won't have to do the integration themselves. Our utility customers will benefit as their system integration costs go down while system performance, reliability, and security go up.

EET&D: Am I correct to assume from the substance and tone of your comments that you're both fairly bullish about the future of grid transformation?

Scholl: I certainly understand that there is a lot of skepticism out there. Much of it is legitimate; there's been far too much hype around the whole Smart Grid concept. But no one should be thinking that this is going to quietly fade away. The need to transform the grid for the next hundred years is more than just a variation of the tagline associated with the original DOE *Grid 2030* concept; it is something that we absolutely must do. How we do it, what technologies we use, how we change the regulatory landscape to accommodate it, how we actively engage utilities' customers in the process, and a lot of other things are at various stages of being sorted out. But what's important to focus on is the fundamental need for transformation.

Waters: The grid that has served us so well for the past 100 years will not adequately address the challenges of the next hundred years. Huge commitments of capital and other resources have already been made, with an eye on the specific needs of a growing population and increasing environmental concerns. As we've discussed on other occasions, Mike, there is probably way too much emphasis placed on smart metering and not enough on the various other dimensions of grid transformation. The ability to turn the power delivery network from a predominantly one-way system into a more balanced two-way topology is no small undertaking that goes far beyond transitioning to two-way communications at the meter level – although that too is certainly a formidable undertaking.

EET&D: A lot of what we hear and read about transforming the grid suggests that there is a huge R&D effort required, but although there is certainly a lot of application-level work to be done, how ready – and more importantly – how available are the tools needed to make Smart Grid a reality?

Scholl: I don't believe there's a limit on human ingenuity. There is no end-point to grid R&D. That said, it's important to realize the great improvements we can make with technology and applications that exist today but have not yet been fully implemented. We're in considerably better shape than some people think. What I fear most is that because the progress to date has been extensively directed to the architecting phase we discussed at the beginning of this interview, that it would somehow be interpreted as a lack of progress. Guerry, I'll let you have the last word. Any thoughts you might like to add?

Waters: From my perspective, I see grid transformation as very much a work in progress. I don't know that it will ever really be finished, any more than the grid we have today was ever finished – or should be, for that matter. There is a very large body of technology available to get the job at hand well under way, and I have every confidence that whatever else we need is well within our collective abilities as an industry to identify and create in a timely and cost-effective manner. Oracle looks forward to being a part of that team effort while doing its part to differentiate itself in ways that are both constructive and beneficial to utilities and their customers.

LightsOn

EXPLORING HAN GATEWAY OPTIONS

By Nathan Ota
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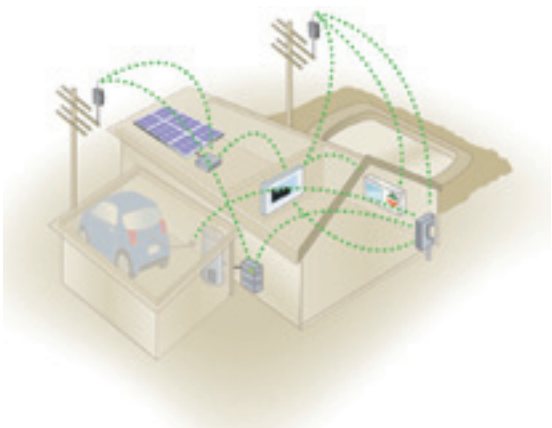
According to a recent report from ON World, a research firm providing business intelligence on smart technology markets, 100 million smart meters will be deployed in the next five years. The report goes on to predict that half of those meters will have a built-in Home Area Network (HAN) gateway for in-home energy management programs and services[1]. The HAN enables energy efficiency, demand response, and direct load control in a Smart Grid deployment. Behavioral energy efficiency utilizing real-time meter data, technology-enabled dynamic pricing, and deterministic direct load control are examples of demand-side management (DSM) applications that are enabled by a high bandwidth, two-way, end-to-end Smart Grid communications network. A Smart Grid that incorporates energy efficiency and demand response increases its value as a long-term infrastructure investment and reduces the time required to achieve a satisfactory return on investment. This article will examine two HAN gateway architectures – integration into the smart meter and the dedicated in-home gateway device.

May I have a HAN gateway, please?

The term "HAN gateway" as used here refers specifically to the function that interfaces the HAN with the neighborhood-area network (NAN), which interconnects meters together into an advanced metering infrastructure (AMI) network. A HAN gateway can also apply to the physical device dedicated to performing this function. Both ZigBee and OpenHAN – standards frequently considered for implementing these networks – recognize the need to support the HAN gateway function, but do not make specific recommendations for where this function should reside, leaving that choice to the utility.



Home Area Network (HAN) Architecture

[1] ON World, "Energy Smart Home Area Networks (HANs)"; June 17, 2009

In these types of projects, there are two prevailing choices that the utility must make: 1) Should the HAN gateway be integrated into the smart meter that communicates with the NAN, or 2) should the HAN gateway function reside in the home in some other device? The utility may or may not care about the specific in-home device employed, but will certainly care about its effect on the Smart Grid business case.

HAN Integration in the Smart Meter or Meter Portal

One obvious way to ensure end-to-end, two-way communications between the utility and the residential subscriber is to have the smart meter become a node on the HAN. In this architecture, referred to here as the Meter Portal, the meter would contain separate NAN and HAN radios – both under the glass – with the HAN gateway function interfacing the two. This Meter Portal architecture is well suited for homogenous and ubiquitous mass deployment of stable HAN technology. The major advantage of this design is that it enables the utility to control exactly how the HAN interfaces with the NAN, the latter being the network used to communicate with all smart meters.

Separate HAN Gateway or HAN Device Portal

This architecture involves locating the HAN gateway function in the home in a designated device, potentially a standalone unit devoted exclusively to this function. This design does not require a separate dedicated device if the HAN gateway function is integrated into a required device, such as a programmable thermostat or in-home display. Whether dedicated or integrated, the in-home device would need to contain separate NAN and HAN radios just as with the Meter Portal.

This architecture – referred to here as the HAN Device Portal – has numerous advantages and offers a flexible, incrementally-deployable solution that is well-suited to supporting a heterogeneous set of evolving HAN technologies, while continuing to afford the utility control over communications with the NAN. Note that both the Meter Portal and HAN Device Portal architectures provide equitable access across the utility's service area, meaning that HAN-based applications can reach everyone with a smart meter.

The difference, however, is that in the Meter Portal architecture, a HAN gateway must be installed with every smart meter; whereas with the HAN Device Portal, the HAN gateway can be deployed either at the time of the smart meter installation or at another date in the future.

Comparing the Architectures

While numerous criteria are often invoked for making architectural comparisons, these four are of particular importance in residential DSM applications:

1. Cost Implications
2. Communications Capability
3. Support for Market Innovation
4. Risk Mitigation

Cost Implications

In both architectures, the minimum number of radios needed to interface the HAN with the NAN is three: two in the meter (NAN and HAN) and one in a home device (HAN) for the Meter Portal; or one in meter (NAN) and two in the home device (HAN and NAN) for the HAN Device Portal. With a prudent choice of radio technology for both the NAN and the HAN, the cost for all three radios is comparable. Using the same basic radio technology, such as IEEE 802.15.4, also has the potential for significant cost reductions through volume deployments. Choosing a popular standard such as IEEE 802.15.4 has the additional advantage of even greater economies of scale as these technologies become more widespread for other applications.

An advantage of the HAN Device Portal architecture is that it permits an incremental, pay-as-you-go approach to implementing DSM programs for residential customers, even when deployment is expected to be universal over the long term. The cost for initial trials or pilots remains low, while the approach continues to present the opportunity for cost minimization through volume during full-scale deployment. Initially, the HAN Device Portal is deployed only to those consumers opting into the energy efficiency or DSM program, such as demand response or direct load control. Depending on the utility's specific program, the HAN gateway function can be implemented in some device already required, such an in-home display, programmable communicating thermostat or direct load controller. This pay-as-you-go approach is unlike the Meter Portal architecture, where the cost-effectiveness of the business case is biased toward full deployment to every consumer, independent of actual participation in any program.

Although HAN technologies are optimized for low cost, the sheer number of homes involved – with relatively few participating in DSM initially – may favor deploying the HAN gateway function in a dedicated consumer device. In fact, the percentage of homes actually utilizing a meter's integral HAN gateway may be quite small for many years. The previously referenced ON World report also predicts there will be only 20 million HAN-enabled households worldwide by the end of 2013. An extrapolation of the data reveals there could be upwards of 30 million smart meters with their built-in HAN capabilities going unused for an extended period. By incurring the cost of the HAN gateway only for those customers participating, as with the HAN Device Portal, the utility stands to achieve a far better return on investment in both the short and longer term.

Communications Capability

The HAN Device Portal architecture affords superior communications capabilities based on the differences in fundamental operational characteristics for neighborhood-area and home-area networks. NANs are designed to operate over greater distances in outdoor environments, whereas HANs are designed to operate at a much shorter range indoors. Indeed, the basic IEEE 802.15.4 framework for HANs conceives a 10-meter (33 foot) communications area, and ZigBee communications utilize transmit powers ranging from a relatively low 1 mW to 100 mW. The shorter range is not a limitation in the HAN, and this intentional characteristic affords the additional benefits of conserving power consumption and keeping costs low, which are both desirable and appropriate in large-scale energy management applications.

Given the fundamental differences in operational characteristics of NANs and HANs, the HAN Device Portal, with its built-in NAN, enjoys an advantage because it can more readily communicate over a considerable distance with the outdoor NAN. For the outdoor Meter Portal to communicate effectively with the indoor HAN, however, it is necessary to overcome some inevitable challenges.

For example, consider just these three common scenarios: a rural home where the meter may be hundreds of feet from the house; a high-rise multi-tenant unit where the meters are in the basement; and a suburban neighborhood where meters may be located behind reinforced concrete walls or other obstacles to make them less obtrusive. With its built-in NAN radio, the HAN Device Portal is capable of providing the long-range communications required in all three scenarios. For the Meter Portal to overcome the RF signal loss caused by the distances and/or attenuation involved in each scenario, additional equipment such as a HAN repeater may be required.

Support for Market Innovation

The market for HAN involves a growing variety of applications and vendor solutions. Moreover, the global nature of this market also affords tremendous opportunities for innovation, and of course, utilities will want to be in a position to leverage this innovation as much as possible.

Consumers (and utilities) have a choice of several different home area networks, including: 6LoWPAN, FlexNet, HomePlug, LonWorks, Radio Data System (RDS), Wi-Fi, Z-Wave and ZigBee. The choices now available for both home networking and power supply combine to have an impact on the choice of HAN gateway architecture.

Residential consumers are increasingly given a choice of power sources, and these retail suppliers of electricity may have their own demand-side management programs, complete with a recommended or required HAN solution. The permutations and combinations of supplier and technology choices have the potential to create an unwieldy situation in some markets. Home energy management devices, many of which use Z-Wave, are now available through retail channels, and some customers are deploying these in advance of any DSM program from their local utility.

This market dynamic creates an advantage for the HAN Device Portal architecture, derived from the modular design possible in a consumer device. Such modularity is beneficial during the design and manufacturing stages, and can also be extended to the retail environment or even into the home with special plug-in modules, such as those conforming to the Utility Smart Network Access Port (U-SNAP).

By having a modular design, HAN Device Portals can be upgraded, replaced, reconfigured or otherwise changed as needed – by either the manufacturer, the consumer, or both – to take full advantage of advances or changes in technology at any time. A U-SNAP module could be used in the meter, of course, but because the radio is under the glass, the only way to support different HANs would be to deploy different versions of the meter. In addition, any changes to the HAN technology would require field replacement of the meter in the Meter Portal architecture.

Modular U-SNAP Device

Risk Mitigation

Any utility enjoys full freedom over the choices for its private neighborhood-area network and private wide-area network (WAN). The home-area network is a different matter, however, because the destiny of HAN technologies – both current and future – will be determined by the market in the aggregate over the longer term.

A possible disadvantage of the Meter Portal architecture is the potential for obsolescence of the embedded HAN technology. HAN standards and technologies are constantly evolving; over the lifetime of a meter (measured in decades) the integrated HAN gateway is certain to require upgrades and/or changes. If the design permits these changes via the network (which has the potential to significantly increase the meter's cost), then the exposure is minimal. But at some point, the design's potential for change may be exceeded. In this situation, the utility has two choices: either replace/upgrade the meter itself (with a truck role) or continue to support the original (now legacy) HAN technology with a special "New-HAN-to-Old-HAN" gateway at the customer premise.

The HAN Device Portal architecture, by contrast, can be implemented in such a way that immunizes it against change. With a design that has the radio modules embedded, the device can be replaced at a relatively low cost and without a truck roll. A better possible design is one with a user-replaceable U-SNAP HAN module. The idea of a replaceable radio module is field-tested with previous technologies, such as Wi-Fi and Bluetooth, and also allows for more cost-effective evolution to a fully embedded design at a time when the technology becomes sufficiently mature and ubiquitous.

The HAN Device Portal architecture implemented with a user-replaceable HAN radio module mitigates risk from changes in both standards and technology. The ZigBee Smart Energy Profile utilizes an IEEE 802.15.4 standard chipset and presumes that the HAN will evolve around a single homogenous protocol. This means that some – or even most – changes would not require replacing the module at all, but simply changing the firmware instead.

With the proper design, firmware can be upgraded via the network, although the upgradeability of an IEEE 802.15.4 chipset for HAN connectivity is ultimately constrained by the physical memory capacity. Techniques for firmware code size reduction and careful design are likely to allow several generations of HAN evolution in a state-of-the-art chipset before replacement is warranted. It is important to note, however, that HAN technology is likely to evolve on a cycle measured in months to years, which is significantly shorter than the anticipated meter lifetime, generally measured in decades.

The HAN Device Portal architecture also lends itself to integration with other networks in the home, including Wi-Fi, dial-up modems, DSL, cable and the "other" HAN for multimedia communications. No one can predict with certainty what home networking and home automation will be like 10 or 20 years from now. In fact, the very flexibility and potential of a design based on an extensible HAN Device Portal may provide the additional incentive some customers need to fully exploit the potential advantages and benefits of home management.

In Conclusion...

Regardless of whether utilities adopt a HAN Device Portal or Meter Portal architecture, the good news is that everyone wins. Smart Grid deployments will continue to be deployed using both architectures. The Meter Portal architecture, as we have remarked, is well suited for homogenous and ubiquitous mass deployment of stable HAN technology. The major advantage of this design is utility control. The HAN Device Portal gives up some of the short-term control in exchange for long-term flexibility and versatility. What's most important, however, is that the Smart Grid is deployed. Ongoing deployments help to advance the goals of energy efficiency, renewables integration and countless other benefits being brought about by ongoing Smart Grid initiatives.

About the Author

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Best Practices at Duke Energy Call Centers:
A Mix of Tech and Touch

By Dennis Gowan, Vice President of Call Center Operations
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Although a call center typically hums with technology, it is the humanity that makes it sing. Best practices in training, response and delivery, are therefore, as much about touch as they are about tech. Call centers must constantly balance efficiency with genuine customer care and concern. That means taking the time to invest in people skills, helping supervisors understand their own personality styles and how they interact with diverse people and personalities, bringing in guest speakers that make "book" lessons come to life, and developing regular feedback procedures for customer service reps to help them continuously improve. Our new hires get one-on-one training with an experienced specialist as well as several weeks of phone lab, where they handle calls in a closely supervised environment. Here's how we do it at Duke Energy...

When a customer calls the power company, chances are, there's a problem. It could be as benign as a request for information or something as potentially serious as downed power lines. In these and other customer call center situations, the person on the other end of the line has to be many things for that customer: Professional, compassionate, knowledgeable, courteous, cool-headed and efficient.

While it may be relatively easy to handle such calls in the normal operating mode when call levels are moderate and the calling customer is calm, it's a different story in times of crisis. An unexpected weather event, an accident, or any of a long list of emergencies involving power assets, create an intensive environment during which call center phone lines are jammed; customers are angry or frightened; and, answers to their questions (at least the right ones in the customer's mind) aren't always immediately available.

That's when proper training kicks in, and with today's focus on workforce efficiency, call center training is more important than ever. Employees must be prepared to leverage technology that can lead to new tools, new efficiency, new confidence, and new success in one of the busiest departments in the utility.

Tech Leads the Way

Technology is woven into the fabric of the call center. The phone system for the call center complex automatically plugs customer service reps into a multitude of networks so they can instantly see issues, understand them, communicate them, and help resolve them. Technology gives quick access to outage and estimated times of restoration maps, billing information, tips, and tools. These online tools also allow reps to help customers manage their utility usage and costs.

Calls to power companies' customer service lines are recorded so that supervisors can routinely check to make sure the representatives handled customer inquiries properly and professionally. In this case, technology helps provide a training opportunity; a learning opportunity. Consider this...

What if you were to take that recording and archiving technology a step further in the training continuum? What if you were to use existing recordings to more broadly communicate best practices? What if you were to have those best-practice calls available on demand as a teaching tool? That's exactly what we did at Duke Energy, and it's one of several approaches we're using to improve the customer experience while at the same time, improving efficiency and professionalism across our team.

Learning from Ben Franklin – Again

Although electricity is the discovery for which Benjamin Franklin is most famous, he invented or conceived a great many other things that continue to impact us today, including the lending library. Duke took Franklin's concept a little further into the digital age by archiving, cataloging, and sharing the recordings of customer service reps' best work.

The Best Call Library extends the practical use of recordings already made, giving them new life beyond the typical approach of using them only for one-on-one feedback for the representative who actually handled the call. The library lets supervisors select a region, call category, and a specific type of call within that category to share with reps as an illustration of best practices in that situation.

"It's a wonderful tool for our new people," says Associate Training Specialist Tammy Haywood. "In the past, so much depended on what was happening in real time as a new employee sat beside an experienced rep to listen and learn. Now, if we want to focus on how to handle an outage call, for example, we can pull from a menu of outage calls that were handled well and say, 'See, this is how it's done'."

Her colleague, Yolanda Lytle, agreed: "It's great for people to hear real-life situations and the flow of a good call," Lytle said. "Plus, reinforcing the positive through the Best Call Library communicates the level of quality we expect."

In addition to audio recordings, the library calls also include video that shows the steps the representative took in accessing information during the call. The audio and video can be paused at any time for teaching moments.

As Nancy Miller, Duke's manager of call center engagement, said: "Hearing how you *should* handle a customer issue is one thing, but actually seeing it unfold – with all of the challenges that come along with it – and knowing that a person sitting perhaps just a few feet away from you did such an outstanding job…well, that is golden."

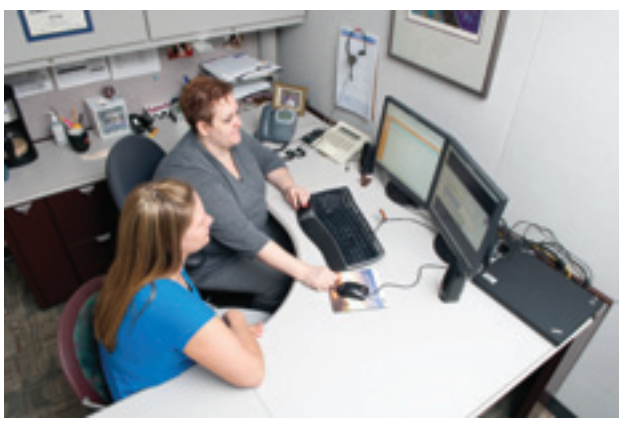
Build It and They Will Come

The Best Call Library was launched at Duke Energy in 2010. This Web portal was developed using available off-the-shelf tools. Chris Lawson, Duke's emerging technologies manager for call centers, got the idea after hearing a colleague mention a similar system used in an unrelated industry. He thought the library approach would be perfect for our business and set about developing a system to provide easy access and clear navigation.

From there, it's been a team effort. Even customers have gotten into the action, as their thank-you calls – and isn't it nice that we get them – often are our first indication that specific calls deserve consideration in the Best Call Library. We also ask call center leads and supervisors to help identify Best Call candidates.

So far, the available categories are billing and payment, business and industry, credit, customer care, energy protection, gas trouble, high bill issues, lighting issues, new service, outage, product promotion, tree trimming and Web support. New calls populate the library each week, and we expect that to continue.

Kendra Charles-Turientine, one of our call center supervisors, recently used the library with a new training class.



Kendra Charles-Turientine explores the Best Call Library with team lead Laura Reynolds.

"I thoroughly enjoyed it and so did the coaches who helped in our training," she said. "Even experienced customer service representatives will benefit from this tool. Being able to see how someone else resolved a situation – even if you've done it yourself – is of great value. People can learn new ways of doing things and realize new efficiencies in the process. I'm really excited about this, and so is my team."

Adding Value Every Day

In just a few months, the Best Call Library has become a trusted resource for trainees and supervisors alike. It also continues to evolve. In addition to providing a fertile training ground for new hires, the library has opened a window to upper management to see the quality of people we hire and the service they provide.

Duke Energy's Best Call Library helps customer service representatives plug into best practices. The library features audio and video so that representatives can watch, listen, and learn. The tapes can be paused at any point to highlight something – whether that is the warmth in the rep's voice, the information on the screen, or the steps saved in resolving the issue.

The library also functions as a tool across multiple areas, including:

- Employee recognition and retention; making it into the library is a badge of honor that is communicated to the team
- Seasonal or issues-based training
- Specialty training
- Call calibration
- Team meetings and analysis
- Trends-based training or reinforcement

Eventually, we may use the library for group training on best practices, or even to help communicate more broadly the good work we're doing in our call centers every day.

To most of our customers, the people in our call centers are Duke Energy. They handle 10 million live calls each year, serving as the voice, face, and heart of our company. We owe it to our customers and to our employees to provide the best possible tools for the call center job, and our new library is a great new addition.

Technology Supports Training at Every Turn

In addition to the Best Call Library that Duke Energy uses, the company also provides computer-based self-training and instructor-led training. Reps also have personal portals in which they can access their own recorded calls, see the feedback on their handling of the call, review evaluations and comments, hear the audio and see the video from their customer experiences, and learn from the feedback.

Technology further supports our customer service reps behind the scene, with well-planned and well-executed trouble-shooting systems, detailed communications processes across every conceivable team, and readily available information on multiple issues. Dual 19-inch monitors on reps' desks function as one giant screen, allowing them to see a lot of information at once without having to take precious seconds minimizing and maximizing data to answer questions. Those seconds add up, and reducing them in turn cuts wait time and frustration for customers, thereby improving the overall experience with us.

Automation also plays a role where possible, but we recognize that the technology is there to serve the people – be they customers or reps – and not the other way around. A friendly voice, a cool head, and an efficient problem-solver are what we value most in our call center, and that's what our customers value too. All of our training and technology are focused with that in mind. And at the end of the day, that's what really defines a best practice. ■

About the Author

Dennis Gowan is vice president of Call Center Operations for Duke Energy. He joined Call Center Operations in November 2009, having previously served as general manager in the Finance Program Office. Gowan has been with Duke Energy for 30 years and has served in various roles and in various departments, including Distribution, Transmission, Finance, Customer Services, and Investor Relations. You can reach Gowan at *dennis.gowan@duke-energy.com.*

About Duke Energy

Headquartered in Charlotte, North Carolina, Duke Energy is one of the largest electric power holding companies in the United States. Its regulated utility operations serve approximately 4 million customers located in five states in the Southeast and Midwest, representing a population of approximately 11 million people. Its commercial power and international business segments own and operate diverse power generation assets in North America and Latin America, including a growing portfolio of renewable energy assets in the United States. More information about the company is available at: *www.duke-energy.com*. To learn more and contribute to the discussion about the energy issues of today and the possibilities of tomorrow, see *www.sheddingalight.org*.

The Evolution of Dynamic Pricing

By Chris Lewis, Cognera Corporation
Calgary, Alberta Canada

As a consumer driven nation, retailers have long offered incentive based programs to impact behavior, and customers have been happy to comply. The most commonly recognizable scenario in our recent past is that of the cellular communications service providers. When wireless technology became prevalent in the United States a decade ago, the country was quick to adopt the latest mobile phone fads – far quicker than the service providers were ready to manage mass adoption. As a result, prices skyrocketed, and a major retooling of rate structures followed.

What is Dynamic Pricing?

As wireless telecommunications companies came up to speed with consumer demand, prices slowly dropped and eventually tapered off at a "peak" and "off-peak" model. These pricing models incented customers to make calls during off-peak periods in exchange for significantly lowered rates. These plans soon impacted consumer behavior, and dynamic pricing came into effect. Today, dynamic pricing has been replaced by pre-paid and other variations of cost management programs, indicating that demand response initiatives are not only successful, but in many cases, inevitable.

Dynamic Pricing Meets the Utility Industry

No one would argue that the utilities industry is currently going through its own pricing revolution. Currently, an array of pricing structures and models are out in the industry being tested—all based on the Demand Response equation. After all, Dynamic Pricing is in many ways a more formal version of Demand Response programs, and according to the Department of Energy, there is a Federally mandated commitment this year to support Demand Response programs throughout the country – and stimulus funding to motivate utilities to adopt these programs.

But these demand response and dynamic pricing programs currently being adopted in the United States can be very confusing, and seem to have their own set of acronyms and technology terms. So, let's take a minute to have a closer look at some of the current initiatives and associated terms before we delve into the "how's-and-why's" of dynamic pricing.

> "For 2010, OE will support the development of demand response by providing technical assistance to independent system operators, utilities, state and regional policymakers to enhance the development of demand response programs, technologies, services infrastructure, dynamic pricing tariffs, and other related activities." – **Office of Electricity Delivery & Reliability Website**

Principal Pricing Structures

The two main pricing structures that have been tested and communicated to date are *Real Time Pricing (RTP) and Critical Peak Pricing (CPP)*. Both of these pricing structures allow for very short notice – usually between an hour and a day – for pricing changes during periods when the cost of electricity is high. The thought is that the stimulus of increased economic burden in times of high cost power will encourage reduction in usage or a change in process to shift a given load to another time period or, eliminate it altogether.

In June of 2008, Baltimore Gas & Electric conducted a four-month smart energy pricing pilot. Peak period hours were defined from 2-7pm on weekdays. All remaining hours were considered off-peak.

As part of their pilot, the utility provided a rebate for customers willing to reduce their energy consumption during peak hours. The results showed an overall reduction of energy usage during these peak hours from 18% to 33%. (The higher numbers reflected consumers who were provided with some enabling technologies to help indicate peak and off-peak hours[1]).

In addition, initial programs for customer pricing have focused on Time of Use (TOU) pricing structures. These pricing structures set the prices for certain hours of the day or times of the year based on historical expectations of increased prices. These "block pricing" structures have, by themselves, shown little impact on actual usage (e.g., PSE&G myPower pricing pilot 2008), and some customers have expressed concerns that the pricing structures are too complicated. Although the incentive exists to shift usage to alternate times in TOU structures, the economic stimulus does not seem to be enough to drive substantive changes in behavior.

In the summer of 2008, Pacific Gas & Electric deployed the first large-scale critical peak-pricing program in the United States. The pilot was conducted over a six-month period. Once again, the utility determined the peak period to be from 2pm to 7pm on weekdays with significant cost savings applied to non-peak hours. Residents received direct mail and other forms of marketing promotions encouraging them to enroll in the program.

As a result, standard customers reduced their peak loads by 16.6 percent on average and 11 percent of customers who qualified for low-income program reduced their peak load by 11 percent. Ultimately, the results proved that with the right amount of notification and education as well as the right cost incentives, customers did respond to behavioral change. However, those numbers could potentially be greater and the question is then: What will ultimately drive large-scale change?

Incenting the Customers

Initial feedback from pilots involving CPP has been quite favorable, as evidenced by a recent study by The Brattle Group. In instances where critical peak prices were introduced and enabling technology utilized, as high as 80% of customers changed consumption behavior, and reductions of 25-44% of peak load have occurred. Therefore, it would seem that the concept of dynamic pricing structures has the potential to meet the goals of peak load reduction. One must ask, however, "Is it really that simple?"

There has been much debate over the actual consumer benefit of pricing structures that link electricity usage to the actual costs at any given time. There is little debate, however, regarding the benefit to the utility. Cost savings in automated meter reading, remote connect/disconnect, and billing and collection accuracy are well documented. There are also savings associated with reduction in peak demand by way of a reduction in the use of high priced peak generation and a reduction in capacity maintenance that is well beyond typical base load needs.

For the end-use customer, the stimulus must be relevant enough – and notably, adoption easy enough – to generate a change in behavior. For commercial and industrial customers where power is a significant cost, dynamic pricing structures can generate significant bottom line savings and create win-win scenarios for both the utility and the customer. For residential customers it is more difficult to justify significant behavioral changes for weekly savings amounting to less than the cost of a cup of coffee. This is where the use of the data will prove to be significant in creating products and rates that are meaningful to target customer subsets.

Dynamic Pricing Options

Various packaging options exist for dynamic pricing, tailored to specific customer groups and sub-groups. Pricing plans vary according to the needs and requirements of each category, as briefly discussed below.

Residential Customers

Of course, the real impact for customers when real-time or variable pricing begins to be reality in the market will be a result of the products and services that the utility puts in place to allow end use customers to adequately manage their risk based on their own personal risk profiles. Like the telecommunications industry, consumers must have adequate choice in the products and services to weigh against the benefits of changing their behavioral patterns. For example, consumers are well aware that making calls after 5pm reduces their bill. This continues to be a strong motivator, as are packaged family plans and various other off-peak incentives.

C&I Customers

To date, many utilities have adopted business intelligence tools to offer C&I (Commercial and Industrial) customers multiple levels of products designed to mitigate risk and allow for behavior change. As with similar tools used in the communications industry, they allow the utility to offer stability and incentives to businesses for bulk purchases (in the case of telecom – wholesale pricing).

[1] "Moving Toward Utility-Scale Deployment if Dynamic Pricing in Mass Markets," IEEE Whitepaper; June 2009, by Ahmed Faruqui and Sanem Sergici of The Brattle Group, and Lisa Wood of the Institute for Electric Efficiency.

BI is setting a trend in the utilities industry to enable utilities to offer custom designed programs to meet the needs of these large consuming customers. Some utilities have begun offering the ability to transfer energy usage to less expensive times and take advantage of lower pricing. Moreover, a number of utilities are currently adopting technologies to integrate energy usage and cost management. These more forward-thinking programs are incenting business owners and providing a model for dynamic energy management and real-time cost savings.

Institutional Customers

In the world of government and institutional users, however, there is a key requirement for stability and budget predictability. This does not remove the requirement for real-time pricing, but it provides an opportunity for the utility to build products that allow for the institutional client to plan their costs and monitor them closely to ensure that budgets are not breached.

Conclusion

Over the longer term – as with any open commodity market – the concept of variability in the electricity price allows for the utility to transfer some of the pricing risk to the end user, which should produce an environment that allows users to understand the market better and make decisions based on the real risks of the commodity they consume. ■

About the Author

Chris Lewis is Head of Marketing for Cognera, where he brings extensive knowledge of the deregulated utilities market and a strong understanding of customer data analytics from direct utility experience. A seasoned utility professional, Chris has held leadership positions with both Enmax Energy and Direct Energy where he was responsible for driving more than $2 billion in revenue growth over five years. He is a graduate of the University of Calgary and a former professional football player for the Calgary Stampede in the Canadian Football League.

Location-based Fleet Management Improves Service, Satisfaction and Safety

By George Jones, Manager of Transportation & Distribution Assets
Portland General Electric, Portland, Oregon USA

Customer service and satisfaction have always been of paramount importance for utilities – particularly when those customers are waiting on a technician to connect or restore their service. In the past, utilities invested in larger fleets, more staff and contract crews in order to speed customer response times. Facing operational cutbacks and lower budgets due to the recent economic downturn, many utilities have had to take a fresh look at how they can maintain high levels of service without hiring more people or buying more trucks.

Over the past few years, there have been a number of technical advancements that can help utilities better manage mobile workers, streamline operations and improve efficiency. The increased prevalence of mobile broadband and smart phones, and the near ubiquity of laptops for field workers, has made communicating with remote teams much simpler. What was missing from these systems was the ability for organizations to track and communicate with assets like utility trucks and boom trucks. Although having the right technician in the field for a particular job is critical, deploying them without the correct equipment can slow down service resolution.

At Portland General Electric, we are looking to location-based technology as a key tool to help optimize our fleet's efficiency, improve customer service and keep our drivers and equipment safe. After evaluating several solutions, we are currently in phase one of our implementation of Telogis Fleet, a Software-as-a-Service (SaaS)-based fleet management system.

Making the best use of resources

One of the most compelling reasons to deploy GPS-based fleet tracking is to improve scheduling and dispatching. With each vehicle containing a GPS receiver, fleet operators have real-time visibility into vehicle and driver locations. Fleet dispatchers no longer have to make assumptions about the best vehicle to dispatch to a location by "guesstimating" where they would be based on their daily schedules. Every truck is visible on a single screen, at any given time.

GPS-based fleet management means that every truck is visible on a single screen at any given time.

PGE has a wide variety of trucks, with a range of sizes and uses, and the fleet management system can show us what type of vehicle is in each location, and what equipment it has on board. If a job simply requires a single-man crew in a repair truck, we would no longer waste resources by sending out a boom truck with a crew of two or more. This saves money by cutting down the amount of fuel used by a heavier vehicle, and allows the company to deploy more valuable resources only where needed.

Crews can also receive schedule updates in the field, as well as turn-by-turn directions to each location. This eliminates the possibility of costly detours and allows managers to route crews away from traffic bottlenecks.

Improved routing saves a considerable amount of fuel and helps us to restore service to our customers more quickly, both of which have a direct impact on our bottom line.

Utilities are a 24/7/365 operation, and PGE is a fully integrated electric utility that provides safe and reliable power to approximately 816,000 residential, commercial and industrial customers in Oregon. It was imperative that the solution could be viewed at any time from various locations. With this in mind, we deployed a Web-based solution that wouldn't require us to host or maintain servers in each location, saving valuable IT resources in the process.

Maximizing crew uptime

Fleet management provides the control room and fleet managers with instant feedback on the activity of each crew. It has the capability to monitor whether the crew is leaving the service center on time in the morning, taking excessive breaks between jobs, or arriving at job sites on time, all of which can have a major impact on a crew's productivity.

The system also enables our fleet managers to track – through a "breadcrumb trail" – precise details of where a crew has been on any given day. It's even possible to set up exception alerts in case a crew deviates from an assigned route or leaves a predetermined area. This information can be transmitted in real time as alerts to home base, as well as aggregated to provide trend reports of crews' performance over time.

Although a crew's work activities are tracked in great detail, it was important to ensure that none of the drivers feels watched by "Big Brother." Drivers were educated about why the solution was implemented, highlighting the improvement in service resolution times and customer satisfaction. Generally, the system has been well received throughout the mobile workforce. From a corporate point of view, the results have been very promising and workforce efficiency has noticeably improved.

Long-term Business Intelligence

Like many other organizations, utilities have a need for actionable intelligence to make long-term strategic decisions about vehicle purchases, maintenance and eventual retirement, as well as optimal staffing. This type of critical business decision was previously made on best-guess assumptions and analysis that, although usually accurate, was not always 100 percent reliable. Now usage data can be extracted from the fleet management system and imported into dashboards, and decisions can be made with a significantly higher confidence level. This generates real long-term efficiency gains for the company while reducing unnecessary expenditures.

Real-time feedback is incredibly helpful in the tactical planning of crew scheduling and dispatch, and for making on-the-fly deployment decisions. Every day it continues to bring the company ROI by cutting fuel spend, reducing the time taken to get to job sites, and speeding customers' service restoration time.

PGE is now able to make more informed decisions about fleet maintenance as well. In the past, the focus has been on historical data, such as how many miles a vehicle has been driven since its last overhaul. While this was generally effective in keeping trucks on the road, it also resulted in a considerable amount of unnecessary maintenance. By contrast, our new system proactively monitors the health of the vehicles and delivers just-in-time maintenance management.

We are learning that sensors can constantly perform a range of diagnostic checks on everything from the battery's voltage to the health of the main or auxiliary engines, providing real-time data on the health of many critical vehicle components. This monitoring will enable us to perform more timely scheduled maintenance tasks and avoids unnecessarily replacing parts that are still within their operational lifespan.

The maintenance staff will have the capability to also receive alerts about components that may be about to fail prematurely and can proactively replace them before they cause a breakdown in the field. As a result, maintenance costs and vehicle downtime can both be reduced.

Ensuring Crew Safety

Although customer service and cost containment are perennial concerns for fleet managers, safety of our crews in the field and our customers are always our top priority. This is another area where technology can deliver a significant benefit. Through a combination of a GPS module and an accelerometer, the control room can get real-time updates on the location, speed and driving behavior of any driver. Therefore, if a truck is accelerating or breaking too heavily, swerving aggressively or exceeding a posted speed limit, the control room or fleet manager is alerted.

This not only provides a safer environment for the crews and other drivers on the road, but it also has long-term cost benefits. Vehicles use less fuel, have less wear-and-tear and are involved in fewer accidents. Furthermore, the system provides a 100 percent reliable record of the manner in which each vehicle is being driven at all times much like the "black box" in a commercial airplane. Therefore, when another driver makes a claim that a PGE truck was being driven in a dangerous manner or caused an accident, the claim could be investigated with complete confidence. This also eliminates the likelihood of the company being the target of frivolous lawsuits.

If a vehicle is involved in an accident, being able to pinpoint its whereabouts is vital, especially if the radio in the cab is not within reach or has been damaged. So far, the new system has had a significant impact on our daily operations, improving efficiency and speeding up response and resolution times. PGE has already started to see possible long-term benefits of the intelligence that the solution provides and expects that over the years, it will continue to deliver strong ROI and enable the best, most cost effective service to our customers. ■

About the Author

George Jones is the manager of Transportation & Utility Assets at Portland General Electric and has been with the company for 18 years. George began his career as a plant design engineer with Los Angeles Department of Water and Power and holds a degree in Electrical Engineering.

It's About Time… for Customer Service

By Eric Camulli, Vice President , Virtual Hold Technology, Akron, Ohio USA

We sometimes forget that our customers' perceptions are our business' reality. When customers call your business and wait on hold for a few minutes, they perceive that you don't care enough about them to answer the call immediately. Some contact center professionals may disagree. After all, we wait for things every day. We wait for the coffee pot to finish brewing. We wait for the light to turn green. We wait for our popcorn to finish popping, and we're not bothered. But a 2008 survey found that waiting on hold was the second biggest frustration for customers… and a confusing IVR – Interactive Voice Response – menu was first!

This is because customers often don't know how long they will be on hold. So the minutes can seem like hours. As time keeps ticking, your customers' emotions escalate from annoyed, to aggravated, to flat-out insulted. Eventually, they will reach a threshold of intolerance where they begin to question why they are even doing business with your company. By the time a service representative comes on the line, the customers are ready to vent – if they're still there, that is.

Often, the anger is justified. Electricity is an essential element of everyday life. Customers who call their electric companies often are in dire straits. They may be sitting in the dark with a refrigerator full of thawing food, and they can't find out when the power will come back on. Even less serious situations, such as billing questions, can create anxiety for customers who are tethered to the phone instead of free to go about their daily activities. Whatever the issue, the customer wants answers… now.

The State of the Customer

It might be possible to avoid damaging customer relationships if companies knew where to locate this threshold of intolerance. For example, if the companies' contact center agents could identify when customers start to feel aggravated, we would be able to implement a strategy to ensure that, at worst, they would reach only the annoyance level of customer dissatisfaction.

Unfortunately it's an impossible strategy to implement. Every customer's breaking point is different. The when and why behind each person's intolerance is dependent upon a myriad of variables that change every day. Things like prior experiences, expectations and people's moods may be different each time they pick up the phone and call you. Waiting on hold for two minutes may be perfectly acceptable one day but the "last straw" the next.

Additionally, people's patience has grown shorter in the Internet age. The phenomenal growth of online social networking and mobile communication has created a cultural shift in our society. Specifically, these new media are creating a more demanding consumer who expects immediacy, convenience and transparency.

Perhaps most important for electric companies, the community aspect of social media fosters strength in numbers. No utility wants to create an army of disgruntled customers who will rise up when they are unsatisfied with the company's offerings or service.

While existing technologies such as self-service IVR strategies are suitable for tasks like paying bills or cancelling service, today's customers don't want to wait for prompts in more urgent situations. They want to talk to a human being about the issue and receive verbal confirmation that the company will take care of it. They also want to speak with someone immediately. Customer complaints have already led many state public utility commissions to regulate hold times and dictate that utilities must answer most calls within a certain time limit.

For that reason, providing positive customer experiences is more important than ever before. Tangible experiences with a company are all that customers have when considering whether or not they are satisfied with a company. They are not privy to the company's excellent first-call resolution rates and high service-level attainment metrics for the month, nor do they care. All they know, as customers, is that when they tried to call, they waited on hold, and hated it. And then they told several friends.

Taking Customer Relationships Off Hold

The good news is that technological advances have also created new ways for utility companies to keep their customers satisfied today. A virtual queuing solution educates and empowers customers with respectful options for managing time. When a customer calls in and the expected hold time is longer than a certain limit (generally two minutes), the customer hears a message that reports the expected wait time and gives the caller a choice of whether to continue to hold or request a callback. The callback comes in the same amount of time they would have waited on hold, without losing their place in line.

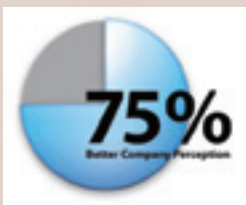
With virtual queuing, callers still have to wait for a response, but the experience is completely different than holding on the line. Sitting on the phone for just a few minutes can seem like an hour, but when the caller is able to hang up the phone, it's almost as if time has been added back into their lives.

More than 70 utility companies in the United States already boast this technology. The Hawaiian Electric Company and Pepco Holdings, for example, have been ahead of the curve in employing the technology to make the most of their customers' time.

Hawaiian Electric prides itself on outstanding customer service, but 2008 price increases and service delays stressed the contact center, resulting in higher-than-normal call volumes and, consequently, long hold times. Virtual queuing made it possible to manage the call volumes without keeping customers on hold. In just the first three months, Hawaiian Electric helped its customers avoid years of hold time without over-staffing its contact center. An additional, unexpected benefit was the impact the virtual queuing solution had on employee morale: instead of conversations beginning with complaints about waiting on hold, conversations are starting with compliments on the virtual queuing option.

At FirstEnergy, we look at every customer interaction as an opportunity to enhance satisfaction and our reputation. And, we know that one of the most common frustrations for customers who call us – or any company, for that matter – is waiting on hold. Being on hold – even for a few minutes – can feel like a very long time.

When we first learned about virtual queuing from Virtual Hold Technology, we saw it as an opportunity to address this common source of customer frustration. Using this system, customers waiting to speak to a representative can hang up the phone without losing their place in line. The phone will simply ring back when an agent becomes available.



While we saw this technology as a way to improve the service we provide, we wanted to make sure that customer would agree. Through a third-party survey we found that customers who accept the Virtual Hold option are more tolerant of "waiting" to speak with a customer service representative than those who stay on the phone. Moreover, 75 percent of customers who experience the Virtual Hold solution have a more favorable opinion of FirstEnergy as a company.

***John Falvy**, Director*
Customer Contact Centers
FirstEnergy Corporation

On the other side of the United States, Pepco Holdings in Washington, D.C., has offered virtual queuing options since 2003 and, in that time, it's become a mission-critical application in the contact center, saving two million minutes per year and boosting the efficiency of its agents. When the contact center experiences high call volume, the virtual queuing solution intercepts the call, informs the caller of the estimated wait time, and offers the caller the virtual queuing callback. Typically more than 50 percent of the callers elect to join the virtual queue; the ones who do choose to hold are less likely to hang up because they know how long they're going to have to wait. Reconnection rates with top-tier virtual queuing solutions are typically well over 90 percent, and Pepco usually sees a 94 percent successful reconnection rate.

In general, when Virtual Hold Technology is treating calls, utility companies using this technology saved their customers 5.7 years of hold time in one year and improved other contact center metrics, including:

- a 60% boost in average speed of answer
- a 56% improvement in service level
- a 57% improvement in abandon rate

It's About Time

Almost every executive will state a commitment to customer satisfaction. Yet, customers continue to experience bad service because the operational expenses required to elevate customer service (technology and head count) are traditionally slashed, thus perpetuating service mediocrity. It doesn't have to be this way. Technology that improves the customer calling experience is cost-justifiable.

Because the services provided by utilities are so essential and because call volume to utilities literally changes with the weather, there's no ideal staffing level in the call center. That is why many utility companies are turning to the latest call center technologies to take their customers off hold and make better use of everyone's valuable time. With virtual queuing technology, a company can offer its customers a more predicable experience regardless of the situation. This not only increases customer satisfaction but includes added benefits such as increased operational efficiency and improved agent morale. ■

About the Authors

Eric Camulli is Vice President of Marketing for Virtual Hold Technology where he is responsible for leading the direction and positioning of new and existing products. With more than a decade of experience in the telecom and contact center industries, Eric combines technical know-how with an understanding of the challenges facing today's contact centers. Eric joined VHT in 1998 and managed all aspects of VHT's products and software releases as the senior product manager prior to assuming his present position in 2002. He holds a bachelor's degree in business administration from the University of Cincinnati.

John Falvy is the Director of Contact Centers for FirstEnergy Corporation where he is responsible for inbound customer contacts received by telephone, fax, web and customer correspondence. John began his career at Ohio Edison in 1977 as a meter reader in Akron. He advanced to customer service training instructor in 1982, and to Superintendent of Customer Account Services in 1991. In 1994, John was promoted to Superintendent of customer accounts in Youngstown. He was named Eastern Region Director of Customer Services in 1994 and promoted to his current position in 1999. John received a Bachelor of Arts degree in Education from The University of Akron in 1980, where he also earned a Master of Science degree in Technical and Industrial Training in 1992.

EXECUTIVE Directions

Professional Association Spotlight

Mark Crisson, APPA, President & CEO

The American Public Power Association (APPA) is the service organization for the nation's more than 2,000 community-owned electric utilities that serve more than 45 million Americans. It was created in 1940 as a non-profit, non-partisan organization. Its purpose is to advance the public policy interests of its members and their consumers and provide member services to ensure adequate, reliable electricity at a reasonable price with the proper protection of the environment. I recently had the opportunity to talk with APPA's Mark Crisson, President & CEO , about the present and future goals and objectives of his organization and its role in grid transformation. – *Ed.*

EET&D: Let's begin with some background on your constituency: Public Power. That very term – public power – has always been a bit confusing because it's pretty easy to confuse the meaning of "public power" with the Wall Street definition of a "public company." Can you perhaps begin by helping to clarify this a bit?

CRISSON: Well, it is a little confusing, but let me offer you this basic clarification. The term "public company" when used in the utility context actually refers to investor-owned utilities – or IOUs – which are publicly traded, for-profit corporate entities. By contrast, municipal utilities – sometimes referred to as MUNIs – are public in the sense that they are municipally owned. That is, MUNIs usually serve a specific geographic area and operate under the auspices of a town, city, county, or state on a not-for-profit basis. By contrast, an IOU is a for-profit corporate entity that can – and often does – operate in several geographic jurisdictions, including the area in and around its home base.

EET&D: Are there other pertinent distinctions between what we collectively refer to as public power and public utilities?

CRISSON: There are a lot of more subtle differences, but I guess the most important distinction is that public power serves the common good of its constituents, whereas a publicly-owned utility rightfully serves the interests of its stakeholders – the majority of which are usually shareholders that have chosen to invest in a particular company – or companies – with an implicit profit motive. Clearly, there is a need for both types of organizations, but naturally we at APPA hold a deep belief in – and unwavering commitment to – the many benefits that public power has demonstrated and delivered to its customers for well over a half-century.

EET&D: What is the purpose, and what are main objectives of APPA?

CRISSON: APPA is dedicated to advancing the interests of the nation's public power systems by providing exceptional advocacy, education and information services. We are a member service organization, and we recognize that member satisfaction is the key to our success. Providing outstanding member service is critical for being a leading association representing public power. Our members – regular and associate – judge the value received for their membership dollars by the quality of information, timeliness, and level of service they receive from an APPA staff is committed to delivering the highest level of member service possible.

EET&D: That seems like a tall order for any organization to fulfill, especially given all of the changes and challenges the utility is facing today. What is the key to meeting those obligations?

CRISSON: That's actually a very valid point. This is no easy task; it requires an organization-wide commitment to building member loyalty through superior customer service. APPA members are our customers. They work in a competitive service industry and have made their own customers' satisfaction a top priority. Our members are keenly aware of the difference between excellent, poor or mediocre customer service. In order to deliver on the promise, every APPA staff member must strive to provide exceptional service to meet these expectations.

Moreover, we recognize that our employees are our most valuable resource. We are committed to fostering an environment where recognition, innovation, communication, and a team spirit are encouraged and rewarded.

EET&D: I know that over its many years of operation, APPA has been immersed in a whole host of legislative, regulatory, financial, and technological and many other policy issues. What are some of the most important ones – those that are at or near the top of your agenda right now?

CRISSON: Problems associated with the wholesale power markets is definitely a big one. In response to continuing problems facing members of the American Public Power Association in regional wholesale power markets, primarily in regions with Regional Transmission Organizations (RTOs) and/or Independent System Operators (ISOs) that are under federal jurisdiction, APPA instituted the Electric Market Reform Initiative (EMRI) in March of 2006. EMRI was established to first assess and then address the market failures and other serious challenges facing public power systems across the country.

EET&D: Could you please elaborate some on what the issue or issues are at the core of that issue?

CRISSON: Sure. The push in the 1990s to deregulate state retail electricity markets coincided to a large degree with migration to RTOs in certain regions of the country. This push was coupled with assertions by state policymakers and federal regulators that lower prices and increased infrastructure investments would be the result.

It has become increasingly clear to APPA, however, that RTO-operated markets are not benefiting electricity consumers, and that prices have increased disproportionately to inflation and other factors like rising fuel costs. In our view, these markets are not competitive; and, we believe consumers are exposed to prices for electricity that fly in the face of the standard of "just and reasonable" rates required by the Federal Power Act.

EET&D: Why is this wholesale power issue such a pertinent one for APPA?

CRISSON: It's vitally important to APPA because almost all public power utilities rely to some extent on purchases from the wholesale markets for the energy they supply to their customers – and many rely almost exclusively on such purchases. APPA, along with many other organizations, asked the Federal Energy Regulatory Commission to investigate the problems in these markets identified through the EMRI studies and to take corrective action, but FERC denied that request. Thus, APPA believes that Congress should exercise its oversight and other authorities to ensure that FERC addresses the problems in these markets, and adheres to its statutory obligation under federal law to protect electricity consumers.

EET&D: What about technology? Is there anything on your agenda that you would characterize as being especially technology-centric?

CRISSON: I guess the one that initially jumps out at me is the cybersecurity issue. The entire electric utility industry – including the American Public Power Association as part of its obligation to serve the public – takes its responsibility to maintain a strong electric grid very seriously. That is why the industry worked together to establish a consensus mandatory reliability regime in the Energy Policy Act of 2005. Partnering with Congress, FERC and the industry self-regulatory organization, the North American Electric

Reliability Corporation (NERC) industry experts, have been engaged in an ongoing effort to establish and enforce comprehensive standards to strengthen the grid. But unfortunately, as the grid evolves so do threats to its integrity. Thus, APPA has recognized that new – but narrowly crafted and limited – authority is necessary to deal with cyber attacks. While APPA believes that the industry itself, with NERC, has made great strides in addressing cyber-security threats and potential emergencies, we recognize that emergency situations may arise that warrant federal involvement. We continue to urge Congress to consider legislation to address these cyber security issues without placing an unnecessary burden on the electric utility industry that may achieve only limited results.

EET&D: Before we close, I have to ask you about one more area where I know that APPA has been very active, and that area is climate change. I've read that APPA supports congressional action to address the issue of climate change but does not support the major legislation that has been considered by Congress to date (H.R. 2454 and S. 1733). Obviously, this is a very complex issue, but can you briefly clarify that position as succinctly as possible?

CRISSON: Yes, this is indeed a complex issue and one that I cannot fully address here, but I'll do my best to keep the answer above the fray as much as I can. Among our concerns is that the present legislation does not adequately control costs to consumers or allow for a workable transition to alternate electricity generation technologies. If a cap-and-trade program is the architecture for federal legislation, APPA believes it should, among other things: include a clear preemption of the Clean Air Act and other applicable federal laws; include a hard collar on the price of allowances; provide emission allowances commensurate with our sector's share of emissions (approximately 2.4 billion allowances using a 2005 baseline); provide those allowances for free directly to load serving entities based on a glide path methodology; and include achievable targets and timelines that allow for a more gradual transition to a low-carbon economy.

EET&D: Do you feel that position is compatible with the best interests of ongoing Smart Grid and grid transformation initiatives?

CRISSON: APPA believes that Congress should ensure that incentives for the development and deployment of renewable and clean energy are provided on a comparable basis to all sectors of the electric utility industry, including the not-for-profit, community- and state-owned public power sector. And yes, we're comfortable that if implemented in that manner, everyone will benefit.

EET&D: At the end of the day, I think the values of any organization speak directly to its ability to achieve its goals and success overall. So I think it would be appropriate to end with a quick summary of those values as pertains to APPA…

CRISSON: Yes, I couldn't agree with you more. Strong, representative values are indeed the foundation of any successful organization, and APPA is certainly no exception. So let me just state what those values are – and I think that everyone at APPA would agree that they speak for all of us…

American Public Power Association Values

- **Integrity:** Engaging in honest and ethical behavior at all times
- **Customer Focus:** Servicing our internal and external customers at the highest level
- **Leadership:** Providing vision, direction, and resources to excel
- **Excellence:** Striving for the highest-quality performance
- **Innovation:** Identifying and making the most of new opportunities
- **Cooperation:** Working as a team to get things done

SECURITY SESSIONS
Volume 2 No. 4

With William T. (Tim) Shaw, PhD, CISSP

On which pile should I toss this document?

Welcome to Security Sessions, a regular feature focused on security-related issues, policies and technologies. In a previous column I touched lightly on the issue of managing information, and the need to establish information categorizations and respective policies and procedures. This is particularly important as regards information that is sensitive in nature, such as any that falls under the requirements of the NERC CIPs or other laws and regulations such as Sarbanes-Oxley and HIPPA. Beyond that, all corporations have information of a financial nature and most will also have information considered as proprietary. Some even have information that they would consider as part of their intellectual property (e.g. secret formulas and recipes.) This month we will take a hard look at information management and the associated security issues... – ***Tim***

Companies – and organizations in general – end up accumulating a lot of information over time. In the good old days (i.e., circa the 1970s and prior) that information would have been captured in strictly physical forms: printed and hand-written documents; books and notes; photographs, slides, film, photocopies, audio and video tape; microfiche, etc. Not to say that there wasn't information contained in the computer systems of the day, but the portion stored on electronic media would have been a tiny fraction of the overall information held by a typical company.

In those days the management, tracking and control of information was done primarily through physical means. And the method for depicting the sensitivity of information was also basically physical: color coded labels, locked filing cabinets, special file folders, cover pages with warning notices, special stickers, etc. Today there is still a vast amount of information maintained in physical forms, and although that 'paperless office' we were all promised has yet to arrive, the shift from physical to electronic is well under way, aided by low-cost and high-capacity computer storage, processing power and network bandwidth.

When information is stored electronically there are different challenges in managing its confidentiality, integrity and distribution than those associated with physical storage. Shredding (properly) and burning a paper document effectively destroys it, but merely "deleting" an electronic document doesn't actually make it go away. If a physical file is handed over from one party to another, the initial partly no longer has possession of it, presuming a copy was not made, of course. But sending an electronic document to another party does not eliminate the one held by the initial party since you are actually just sending a copy. Likewise, if someone alters a physical document, that tampering may be easily detected. But alterations to most electronic documents are normally undetectable.

All of this makes for special requirements in order to provide equivalent (or superior) information management in an electronic environment. There are even information management challenges at the transition points between electronic and physical mediums.

For example, many of those networked printing centers and their digital copier/scanners contain hard drives. A document passing through one of them may be retained on disk for an undetermined time until eventually being overwritten. The study and addressing of these issues is part of what Information Technology is all about – well, that and getting your PC working again when you catch the latest virus or forget your new, really-long-and-complicated password!

From this point, I'll restrict my discussion to electronic information management, since most organizations already have processes and procedures in place for managing physical information. (They may be terrible, but they probably exist!)

The first step in managing information is to make a determination of the various categories of information you need to manage and protect. Then, you need to define the rules for controlling access to such information and the protective requirements for that information within each category. Typical information categories include things like company financial information, customer proprietary information, personnel/employee information, sales and marketing information, production information, payroll information, maintenance information, and so forth. For electric utilities, there is also the information associated with critical bulk electric system assets, the associated cyber systems and the cyber security program itself, all of which must be identified and protected per NERC CIP-003.

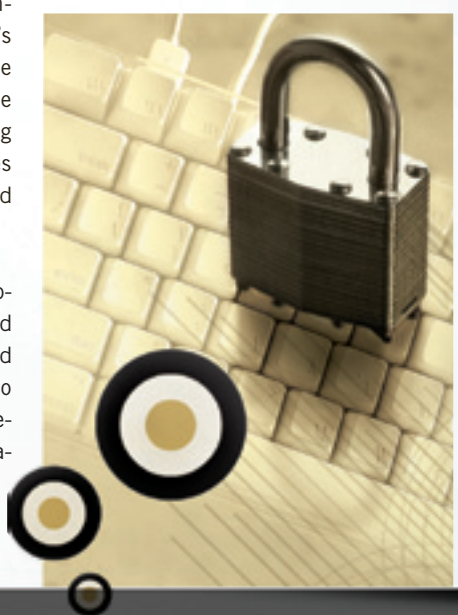
Information access control determines who is allowed to see, copy, modify and delete information and with the procedures and mechanisms associated with each such activity. Some categories of information may be freely available to all to see –but not to alter or delete. One example of this category is the information posted on your company web site.

Other information may be restricted to only employees (i.e., "company internal") or subsets thereof, as defined by job function or title or department (e.g., only people in HR can access personnel information and only people in accounting can access payroll information). Individuals within a given access group may vary in the extent of their permitted access. That is, they can see but not delete, or see but not copy, the information.

Some information needs to be especially well protected due to the consequences that could result from its loss, disclosure to unauthorized individuals or alteration of the information without permission. Everyone understands that having a drug formulation improperly disclosed could have major financial consequences. However, it's less obvious to people outside the industry – and perhaps some people inside the industry – that having generation unit outage schedules disclosed could impact the bid price in a power market.

NERC CIP-003 requires a utility to protect sensitive information associated with their critical assets, systems and cyber security program; failure to do so could result in a violation and a subsequent penalty. Protection of information may involve the use of encryption to make the information unusable to those not authorized to have it, and it may also involve duplicating the information – whether on a 'shadowed' disk or by making a backup copy on removable media – to prevent any data losses due to computer failures. Encryption, in the form of "hash codes" (also called message digests) generated from a given document, can also be used to detect alterations of that document. Access to information can be restricted and controlled by the assignment of user accounts that allow/deny access to specified servers, file systems and/or directories. When information is transmitted between computers (including manual transfer on portable media), encryption can also be used to protect it from eavesdroppers or theft.

As I mentioned earlier "deleting" and/or "transferring" electronic information doesn't usually have the same results as with conventional (usually paper-based) data storage because with most electronic media, "erasing" the information doesn't actually make it go away.



So if it's essential that a file containing sensitive information be truly deleted, then special steps have to be taken to make certain that true erasure actually happens. NERC CIP-007 requires that data storage media from CDAs (critical digital assets) being redeployed or retired must be completely erased or destroyed. Merely "deleting" all the files on, or even re-formatting, a hard drive will not prevent data recovery by a dedicated foe. The National Institute of Science & Technology (NIST) recommends a multi-pass random data overwriting of a hard drive in order to make its contents truly unrecoverable. Personally, I prefer a sledge hammer.

Change control and auditing of electronic information can also be a challenge. Most of the documentation that needs to be created and maintained as part of a NERC CIP-compliant cyber security program is also supposed to include an audit and approval trail. An electronic document, such as a Microsoft-Word document, can include a couple of pages for a modification log and can even use the change tracking features built into that package. But such a log is only trustworthy if everyone having access to the document is equally trustworthy and follows agreed-upon procedures.

Indeed, there is nothing about a basic word processor, spreadsheet or other such application that forces compliance with modification logging and auditing procedures and policies. However, document management packages exist to solve that problem. With such a package, electronic documents must be checked-out by users, with the package keeping track of who did this and when. Then, the package compares and logs changes to every document when it is checked back in by a user, as well as recording that event. Most document management packages allow modifications to be rolled back (i.e., undone) to recreate any prior version of a given document.

Another critical step in managing information is to establish a written policy – as well as the associated educational processes – that will inform and guide employees and contractors as regards the classification, proper handling and required protection of sensitive information. Always remember that if you want people to treat information properly, you must tell them what is expected of them and also explain the consequences for violating the security policy. Where information protection is tied to actual laws or regulations, people especially need to be made aware of this and that there may be legal consequences that go beyond those the company may impose for security policy violations.

Regular readers know that, on occasion, I've suggested that IT professionals don't always understand the subtle but serious differences between pure business/IT systems and mission-critical automation systems. On the other hand, electronic information management is something the IT folks know far better than your average automation/control system engineer. Reaching and maintaining fully auditable compliance with the NERC CIP requirements involves creating, protecting and maintaining a lot of documentation and information. This is one area where I would highly recommend involving your IT organizations. And there are other areas too, but that will be the subject matter 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 30 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 and has also contributed to several other books. 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 *timshaw4@verizon.net.*

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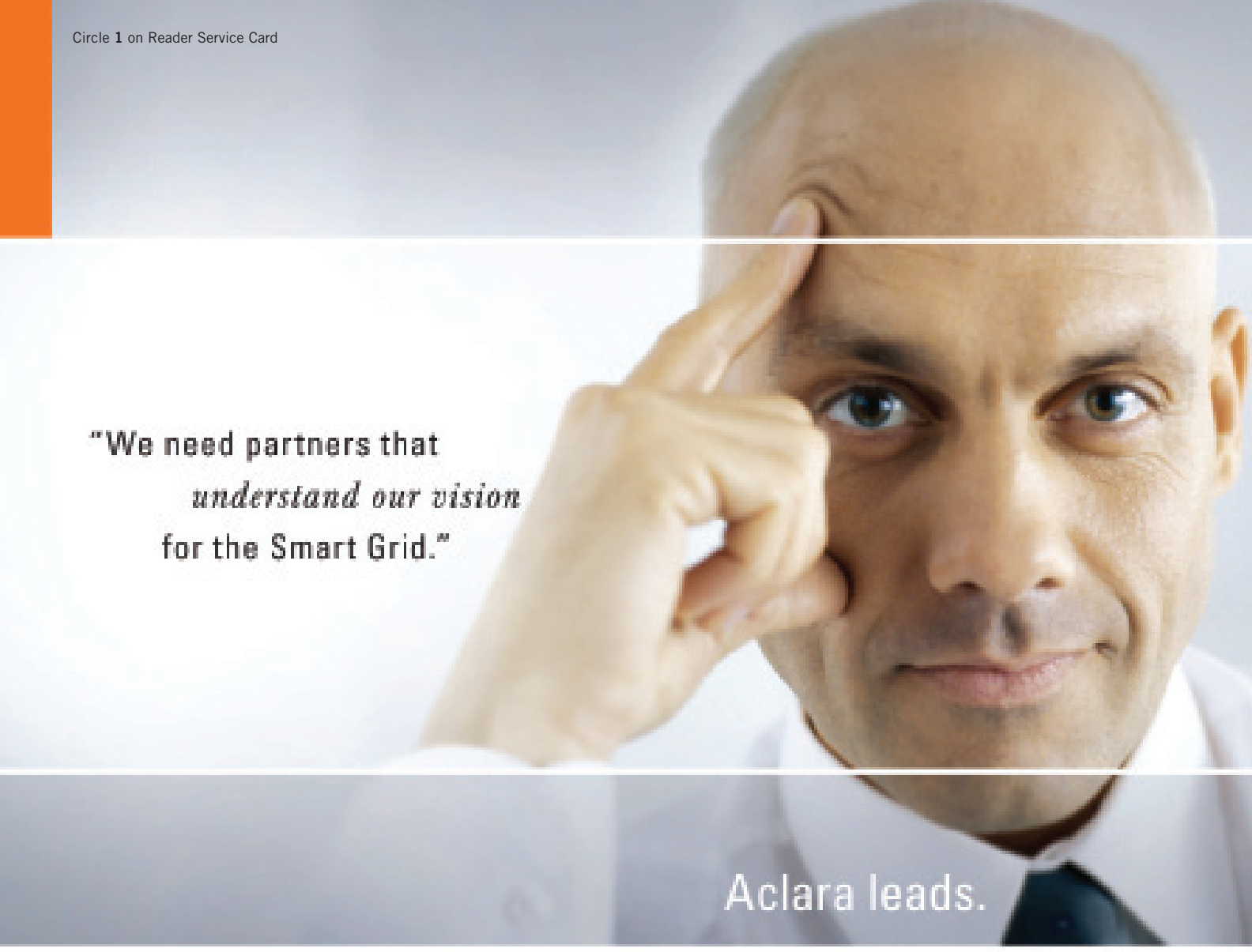

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