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Electric Energy T&D MAGAZINE

MARCH-APRIL 2006 Issue 2 • Volume 10

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Electric Energy T&D MAGAZINE

IN THIS ISSUE

Improving North American Electricity Markets

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

Each Spring, senior executive from Canadian electricity companies, members of the Canadian Electricity Association (CEA), travel to Washington to meet with US officials to discuss areas of common concern. This has becomes an annual opportunity for CEA to reflect on the North American electricity market, consider the strengths and weaknesses of our shared infrastructure, and make recommendations on how the market can be improved.

The North American electricity system, which interconnects Canadian and U.S. electricity markets, is among the most integrated and reliable in the world. It combines a diversity of fuel sources, extensive transmission interconnects and two-way trading that benefits both countries.

The diversity of the Canadian and U.S. electricity systems, the different balances of conventional and emerging technologies in our various regional generation mixes, and the differing market demands region by region over days, weeks, and seasons, have prompted a level of trade that benefits electricity consumers in every region across the continent. When linked across the international border, our diverse systems have created opportunities for efficiencies in regional systems management, reduced environmental impact, and improved reliability; these are vital achievements for all concerned.

Cross-border trade enables market participants to take advantage of diversity between the Canadian and U.S. electricity systems. The diversity and complementarity of our systems are first demonstrated by the different balances of various conventional and emerging technologies in our generation mixes. These differences primarily reflect availability of resources, as different geographic regions have access to different input resources.

Electricity is now established as a key and growing part of the larger energy trade between the two countries, and it is increasingly two-way. Electricity trade between Canada and the U.S. stems primarily from two sources. First, generators in Canada are key suppliers to particular U.S. markets. In addition, generators in both countries take advantage of the trading relationship to optimize the performance of their respective asset portfolios, which contributes to lower electricity costs and higher overall system efficiency and reliability.

The quantity of electricity exported from Canada has typically been 6 to 10 percent of production. At the same time, electricity imports to Canada have increased significantly. The fundamental point is that the market is a borderless one, and supply meets demand north to south or south to north as that market requires, to the advantage of consumers across the continent. Robust competitive wholesale markets in both the U.S. and Canada rely on integrated U.S./Canadian markets. As the markets continue to open, the importance of cross-border trade will only increase.

Until recently, restructuring of the electricity industry followed a similar pace in both Canada and the U.S. The drive to open markets in both countries, however, appears to have stopped, at least for the present. Currently, approximately 50 percent of Canadian retail customers are in open markets (although regulated rates remain available to retail customers in both Ontario and Alberta).

The Economic and Environmental Benefits of an Integrated Market

Cross-border electricity trade provides the opportunity to optimize the use of generating resources to the benefit of U.S. and Canadian market participants. When linked across borders, the diversity of our systems, our climates, and our demand profiles allow for efficient power flows north or south at various times depending on market circumstances. The resulting regional market efficiency gain reduces the overall need for generating facilities and results in lower generation costs to consumers. Such opportunities exist to a greater or lesser extent in each of the regional markets across the continent.

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

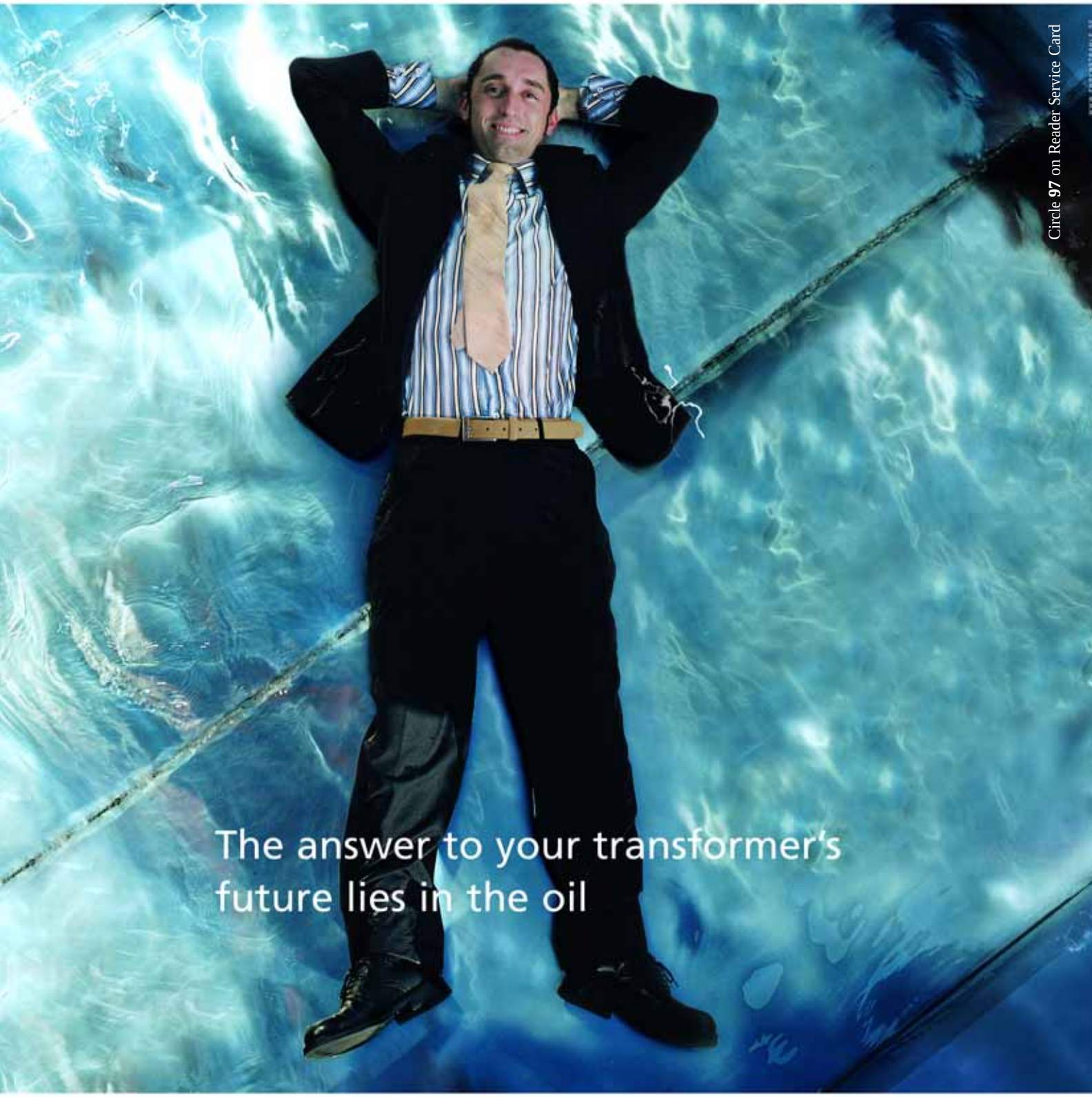
The objectives of reliable, affordable, environmentally preferable power require that all technologies be available. Increased integration enables the larger, combined U.S. and Canadian regional electricity markets to take full advantage of various emerging technologies like wind power, whose intermittent nature requires backup capacity, to meet our future energy needs on a larger scale. In fact, wind power technologies offer greater reliability where there are increased cross-border system interactions, through diversity of supply over larger geographic areas.

Setting the Stage: Factors Affecting Investment in the North American Electricity Market

The bi-national electricity trading system that has evolved between Canada and the United States over more than a half century is, like the trading relationship in general, without compare. What began with small tie-lines and the development of boundary waters for hydroelectricity has evolved into extensive cooperative arrangements for managing transmission system reliability, major inter-ties across the Canada-U.S. border coast-to-coast, and significant trade volume, in both imports and exports. And since the 1980s, the combination of international agreements and regulatory actions has allowed for the creation of integrated North American electricity markets.

Looking to the future, investment in this integrated market will be affected by a number of factors, including legislative and regulatory measures, as well as policy directives. These factors set the stage for investment opportunities in our integrated North American markets.

The U.S. Congress passed the Energy Policy Act of 2005, in part, to encourage investment in all sectors of the energy industry, including electricity. The Act promotes both conventional technologies and emerging technologies, recognizing the need for promoting all energy sources to assure the sustainability of electricity



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supply. And while the Energy Policy Act is U.S.-focused, the Act will necessarily affect the North American electricity market as a result of the interconnected nature of our respective transmission systems and the interrelationship of electricity supply.

A number of provisions in the Energy Policy Act could encourage investment in this integrated North American electricity market. Of far-reaching impact, in terms of investment in both generation and transmission facilities, is the repeal of the Public Utility Holding Company Act ("PUHCA"). PUHCA had contained provisions restricting investment in U.S. utilities by foreign companies. With the repeal of PUHCA, these restrictions on foreign investment are eliminated.

In terms of transmission facilities, several provisions will help to ensure a truly integrated North American grid and encourage investment in cross-border transmission facilities. First, the reliability standards language in the Energy Policy Act will allow for the establishment of an international Electric Reliability Organization to develop mandatory reliability standards in both the U.S. and Canada. Moreover, the Energy Policy Act encourages transmission investment by providing backstop siting authority, requiring FERC to establish incentive-based rate treatments for transmission facilities, and providing two new tax provisions. Such provisions could allow for increased transmission investment across our respective borders.

The Energy Policy Act should also serve to encourage investment in generation facilities in the North American market, thereby increasing electricity supply. The Energy Policy Act encourages the development of clean coal facilities, encourages the construction of new nuclear facilities, and provides support for renewable technologies in the United States.

While the U.S. Energy Policy Act will play an important role in encouraging infrastructure and supply investment in North American markets, other factors will also have an impact on investment decisions. Energy policies promoted by other respective governments will certainly affect investment decisions. For example, a number of Canadian provincial governments are requiring minimum levels of renewable energy purchases. The government of Ontario has committed to adding 2,700 megawatts of new renewable energy to Ontario's electricity system by 2010. And the British Columbia Energy Plan has a 50 percent clean energy goal for new electricity demand over the next 10 years. While the U.S. Congress did not include a renewable portfolio standard in the Energy Policy Act, a number of states have adopted renewable mandates in their respective states.

Policy actions taken with respect to climate change will also have a significant impact on generation investment decisions in the U.S. and Canada in the future. Canada, a signatory to the Kyoto Protocol, must have in place the mechanisms to achieve a reduction in greenhouse gas emissions of 6 percent below 1990 levels for the 2008-2012 period. Looking ahead, Canada agreed to the Montreal Action Plan of December 2005, a commitment for further international action on climate change and greenhouse gas reductions by industrialized countries beyond 2012. While the U.S. is no longer committed to the Kyoto Protocol reductions, any actions taken by the U.S. in the coming years will impact investment in the fossil-fuel generation technologies.

Regulatory actions will also influence investment decisions. Since the passage of the Energy Policy Act, FERC has issued several rulemakings to implement certain provisions in the Act and is in the process of completing other major rulemakings. Relevant to cross-border investment decisions, FERC has issued rules implementing the provisions of the reliability standards language, the repeal of PUHCA, and the changes to Section 203 (the merger provision). Other rulemakings will follow, including rules to establish incentive-based rate treatments and rules to implement the native load language. The U.S. Department of Energy is also conducting workshops and studies to implement provisions in the Act relating to the transmission grid. The results of such actions could help to identify necessary grid investments along the Canada/U.S. border, as well as identify the necessary incentives to make such investments. Finally, the Department of Energy and other U.S. agencies are implementing a number of provisions in the Energy Policy Act to promote enhanced electricity supply.

Growth in electricity demand in Canada and the U.S., as well as the retirement of aging or environmentally-challenged facilities, will require increases in generation capacity in our respective countries. Both the U.S. and Canada project the need to increase generation capacity by approximately 25 percent by 2025 to satisfy increases in demand. Increases in generation capacity will require increases in transmission infrastructure to ensure that such supply reaches all end-use customers.

Electricity supply and infrastructure solutions for the U.S. and Canada will necessarily reflect the availability of our respective fuel supply, taking advantage of the diversity of fuel sources. Whether conventional or emerging generation technologies, investment should focus on assuring sustainable generation sources for our respective countries. Investment in transmission infrastructure must also help to address constraints along the border, which will allow for enhanced cross-border trade.

The United States and Canada share the challenges of ensuring the future adequacy of electricity infrastructure and supply, and we need to address these challenges cooperatively. CEA proposes the following areas of bi-national cooperation to promote effective investment in electricity infrastructure and supply in the North American market:

- Cooperation in Enhancing Electricity Supply
- Cooperation in Enhancing Transmission Infrastructure
- Cooperation in Addressing Air Quality Issues and Climate Change

The integration between Canada and the United States will only increase as energy demand and trade continue to grow. This makes close cooperation between our countries a necessity. The benefits of cross-border cooperation are clear; the challenge is to identify the approaches that will take advantage of our diversity of supply and help to ensure a reliable North American electricity market in the future. Resolving our electricity infrastructure and supply needs must be an international concern, requiring the full engagement and cooperation of both countries. Anything less could impede future cross-border trade and, more significantly, undermine the very sustainability of supply we all seek to see guaranteed. ■

Itron Introduces Positive Outage and Restoration Functionality

In its continuing efforts to extend the value of advanced metering technology across the utility enterprise, Itron has launched Positive Outage and Restoration functionality for Fixed Networks.

Itron's Positive Outage and Restoration solution provides utilities with the most reliable, precise and easily managed AMR/AMI-based outage detection and restoration notification system available in the industry. It will be available this summer.

With the new system deployed as an integral component of Itron's Fixed Network 2.0 meter reading technology, outage and restoration alerts based on programmable parameters are transmitted immediately from CENTRON® Solid-State R300 meters and processed by the network to quickly pinpoint the location and determine the extent of a power outage. That report can then be passed immediately to the utility's outage management system (OMS) to expedite response and optimize dispatch of restoration resources.

Today, most utilities still rely on a combination of SCADA data from the substation and feeder levels of their distribution system, along with customer calls and visual inspection by field crews to detect, locate and verify power outages and restorations. Positive Outage and Restoration functionality through Itron's Fixed Network provides distribution system operators with an additional source of timely, accurate, outage and restoration data at the individual customer level, enabling utilities to respond in a more timely and effective manner.

"Historically, AMR radio-based outage detection systems have really not lived up to their billing. The timeliness, quality and reliability of the data hasn't been good enough for utilities to rely consistently on their AMR systems as a front line tool in their outage management efforts," said Malcolm Unsworth, senior vice president of Itron hardware solutions. "Utilities want robust functionality from AMR-based outage detection systems. With the introduction of our Positive Outage Notification capability, Itron is taking AMR-based outage detection to a new level. With this system in place, an outage – whether large or small – can be detected and located within two minutes, often ahead of customer calls." ●

For more information, visit:
www.itron.com
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Positronic Releases New Miniature Power/Signal Connector

Positronic's new Dragonfly Series is ideal for use in applications requiring a high reliability miniature connector, which offers signal and/or power contacts.

The Dragonfly offers contact current ratings of 20 amperes continuous for Size 16 contacts. Size 20 contacts are rated at 12 amperes when used with 18 awg wire. Dragonfly Size 16 contacts have been tested to 10,000 mating cycles. See catalog for details.

Dragonfly features include: Multiple package sizes with an integral quick latch locking system; crimp contact and PCB terminations; closed and open entry female contacts; and a variety of accessories.

Positronic is pleased to add the Dragonfly Series to our wide range of power and signal connector offerings. ●

For more information, contact:
Positronic Industries at 800-641-4054,
or visit us at www.connectpositronic.com
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Milton Hydro, OZZ Energy Solutions, and Trilliant Networks: Technology Pioneers in a New Energy Economy

Milton Hydro Distribution Inc. (Milton Hydro) has announced a key decision to fortify electrical Smart Metering activity throughout the Town for the 2006 calendar year. Using OZZ Energy Solutions Inc. (OZZ) as their implementation partner, Milton Hydro is poised to deploy upwards of 5000 electrical smart meters to households across their distribution territory, utilizing Trilliant Networks' (Trilliant) advanced wireless mesh communications infrastructure.

This innovative mesh technology facilitates two-way meter communication between a residence and utility. This means that, in addition to collecting consumption data at the meter, Milton will be able to broaden their base of customers who access information on, and constructively use, new regulated Time-of-Use (TOU) or market pricing.

"Milton is further advancing our smart metering activity based on the demonstrated strength of the mesh communications infrastructure," declared Don Thorne, President and CEO of Milton Hydro. "The technology has undergone testing by our engineering department and we are satisfied with the results." Mr. Thorne adds, "Used in conjunction with Time-of-Use rates, this smart metering technology will empower our customers to evaluate their consumption behavior and begin to strategize and implement conservation and demand measures within their homes."

The OZZ Advanced Metering Infrastructure (AMI) solution selected for the Milton project is based on the MeshReader™ smart meter technology from Trilliant. The Trilliant solution provides multi-path and multi-network capability including connectivity with wireless broadband products, fiber networks and open LAN based systems.

Trilliant's MeshReader™ technology is an ingenious evolution of communications that enables meters on adjacent houses to talk to each other, creating an intelligent network or "mesh" that propagates reads from meter to meter and ultimately to a data collector that keeps track of hundreds of meters. Trilliant's data collector, the MeshGate™, then transmits the data back to the OZZ Global Data Centre, where it is validated and ready for billing. ●

For more information please visit Milton Hydro web site at www.miltonhydro.com.
For more information, visit Trilliant's Web site at www.trilliantnetworks.com.
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Comverge & Landis + Gyr jointly announced the formal release of the Maingate S4 underglass AMR gateway at the DistribuTECH show in Tampa, FL. Key Features Include:

• CDMA 1xRTT or GSM/GPRS Networks • Circuit or Packet-Switched Operation • Internet Protocol (IP) in the Packet Assembly/ Disassembly (PAD) Mode or the Advanced UCA/MMS Mode • Internet Protocol using Fixed or Dynamic IP Address • Over-the-air Transitions to Different Network Modes • Advanced Power Quality Functions • Complete Range of Installation Options Available Including External Antennas, RF Attenuators, and Directional Antennas • Reduced Communications Charges • Over-the-air Patches Respond to Changes in Network Operation • Watchdog Timer • Full support for all S4 features

The Maingate™ S4 combines the CDMA Gateway proven in the largest digital cellular AMR system in the US with the most popular polyphase meter in the US in one tightly integrated package. The Maingate™ S4 offers multiple modes of operation for compatibility with existing master station software, offering a robust array of configurations. The S4 is also extremely fast and reliable: when operated in the most advanced mode, Maingate™ S4's enable reading over 100 meters per second with a daily read success rate of over 99%.

The Maingate™ S4 offers the lowest operational cost of any meter. Plug and play installation, automatic database population and an extensive set of gateway displays that use the S4 LCD all contribute to quick and easy installation. Extensive over-the-air diagnostics and monitoring many anomalies can be resolved without a site visit. Additional savings can be achieved utilizing the MMS Mode which uses a compressed version of the ANSI C12.19 table structure along with the MMS Protocol recommended by the EPRI Utility Communication Architecture initiative for all machine-to machine communication. This protocol requires less than 15% of the raw data to transmit a given amount of data, resulting in air-time cost savings of up to 50%. ●

For more information, please contact Comverge at sales@comverge.com or by phone at 888.525.5565
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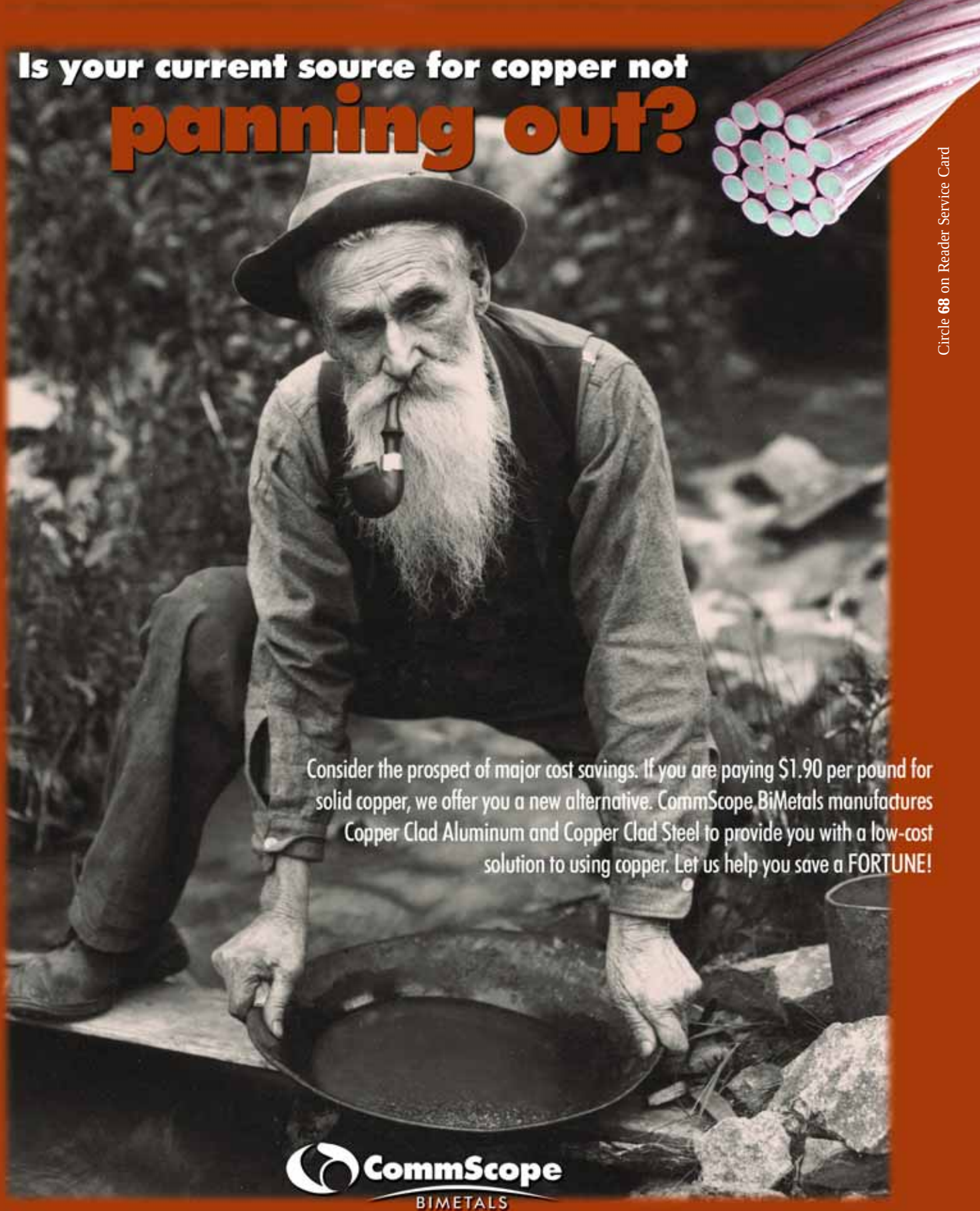

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For more information, visit our website at www.commscope.com or call 704.883.8015 for further support.

Info Energy & Marsh Creek: Reseller Agreement

Carl Kelly, President of Info Energy Inc. is pleased to announce the establishment of a Reseller Agreement with Marsh Creek Technical Services in Alaska. Marsh Creek will be responsible for the marketing, distribution and implementation of the AMPY Pay-As-You-Go smart metering system. The AMPY system complements the existing sales and services offered by the company throughout Alaska.

Marsh Creek, LLC is located in Anchorage, Alaska with 19,000 square feet of office and shop space, with an additional 2.5 acres in an industrial area for large modular construction projects. Marsh Creek LLC is a licensed general, mechanical and electrical contracting company complete with Electrical Administrators, Journeyman Electricians, Certified Mechanics and Welders.

Marsh Creek, LLC consists of four divisions, Marsh Creek Medical Services, Marsh Creek Environmental, Marsh Creek Construction, and Marsh Creek Technical Services.

The company's staff has many years of Alaskan experience providing the following services:

- Sales, installation and maintenance of AC and DC power equipment.
- Design and engineering of power plants and electrical distribution systems.
- Project management services.
- Construction and installation of modular and conventional power plants.
- Construction and maintenance of underground and overhead electrical distribution systems.
- Design and manufacture of custom power generation and Arctic Modules.
- 24-hour emergency response service.

Marsh Creek employs experienced Alaska State licensed electricians, certified mechanics and welder/fabricators whose careers have focused on the installation and maintenance of AC and DC power generation and distribution systems statewide. ●

For more information, contact Clarissa Quinlan about the AMPY Pay-As-You-Go Metering System at (907) 258-0050 Fax - (907) 279-5710
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BROOKS UPG EXPANDS HIGH-SECURITY PRODUCTS LINE

As meters become more sophisticated, keeping them secure is becoming more important. To help meet the needs of utilities, co-ops and contractors, Brook Utility Products Group is expanding its line of high-security meter security devices.

One new line of products being introduced is the I-3 and I-4 Series of stainless steel barrel locks that are comparable to the Jimi/3 Dot and the Mark IV/4 Dot barrel locks. Brooks Security Products' I-3 and I-4 provides high-security protection for ring- and ringless-style meter sockets and gas valves. The I-3 Series is available now, while the I-4 Series will be available during second quarter 2006.

The I-3 and I-4 Series feature:

- High security, stainless steel barrel lock with unique key.
- Weather seal for keyway protection against bugs, dirt and debris.
- Field repairable key.

The Click Ring is the other new addition to Brooks Security Products' hardened, high-security product line. This high security ring is ideal for AMR deployment or contractor installation, as it can be installed without a key. Ring design promotes utility security and key control.

The Click Ring is available in stainless steel, and with F, G and I Series locks. It also will be available during second quarter 2006.

"We're seeing more utilities and co-ops reviewing their security needs as they also review their operations, and add new services or upgrade to new technologies," explained Steven Rios, marketing manager for the Brooks Security Products unit of Brooks UPG.

"Meter seals will always be necessary for meter security. However, many are considering where higher-security devices should be used," Rios added.

The new products are in addition to Brooks Security Products current line of hardened security products. These include the Snap Ring™ high-security locking device for ring style electric meter sockets, and the Quik Lock™ security locking device for ringless electric meter sockets. ●

For more information:
Brooks Utility Products Group, part of the E.J. Brooks family of companies, consists of Brooks Ekstrom, Brooks Meter Devices and Brooks Security Products. Brooks UPG provides a complete line of metering related products for the utility and electrical contracting industries. For additional information visit www.brooksutility.com.
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Flex® WITH AMDS CONNECT™ Net

The most flexible, reliable AMI* system available.

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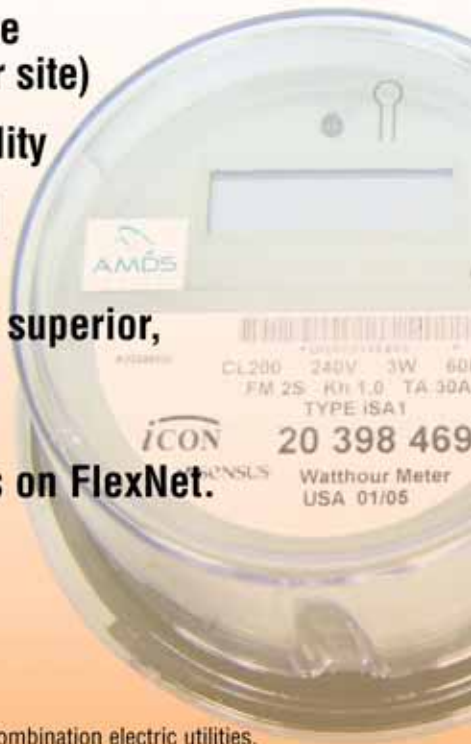
FlexNet with AMDS Connect technology offers utilities a comprehensive fixed network solution, providing advanced meter reading information, demand response and customer messaging capabilities. Features of this superior and powerful fixed base system include:

- **2-way and 1-way communication options**
- **Long range means less infrastructure (40 to 200 square mile coverage per tower site)**
- **Incorporates demand response capability**
- **Flexible – handles both residential and C&I metering installations**
- **Operating and maintenance services ensure superior, maximum operation of network**

*Advanced Metering Infrastructure



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TWACS® TECHNOLOGY

TWACS communication technology is truly unique, as it works by modulating the voltage waveform at the zero-crossing point, resulting in a communication system that uses the utility's network at the frequency for which it was designed and built. Data can be transmitted through any transformer or wiring configuration. TWACS requires no line conditioning or repeaters, and is not affected by capacitor banks, noise harmonics, feeder switching or underground to overhead transitions.

SYSTEM TECHNOLOGIES

DCSI provides utilities with a true two-way communication system and associated transponder products for AMR, Interval Data Retrieval, Dynamic Load Profiling, Time-of-Use data for Critical Peak Pricing, 20-second On-Demand Reads, Load Control and Management, Power Delivery Quality Monitoring, Prepayment, Remote Hard Disconnect/Reconnect, and Tamper/Leak/Theft Detection. In addition, the TWACS Outage Assessment System (OASys™) is available as well as Short-Hop Radio Frequency (RF) as a solution for reading proximate gas, water and pit-set meters.

ADVANCED APPLICATIONS

TWACS OASys™ technology enables outage discovery, notification of appropriate personnel before the first customer call, system-wide outage assessment and accurate monitoring of restoration progress. TWACS AMIgo™ system enables delivery of vastly increased amounts of interval data at an extremely high rate of speed by fully exploiting parallelism inherent in the electrical grid. Utilities will find that compliance with provisions of the Energy Policy Act (EPACT) of 2005 relating to advanced metering devices can be more easily satisfied with deployment of the TWACS AMIgo system. TWACS Prepaid Metering technology (PowerStat) enables utilities to offer customers the benefits of a more flexible billing approach, which will serve to provide those customers better means of managing and controlling energy expenses. Gas, water, propane and pit-set metering is enabled by utilizing the Badger Meter ORION® and TWACS RFL technologies. Since TWACS provides two-way communication to, and into, each home and business, opportunities exist for communication-based consumer services, including energy efficiency, billing options, home automation and remote site monitoring.

LOAD CONTROL

TWACS load control and interval data delivery enables a utility to meet Demand Response provisions of the 2005 Energy Policy Act. TWACS multifunctional load control enables utilities to reduce highest-cost peak demand by creating the optimum diversity of deferrable loads without impacting energy sales, resulting in improved load factor. The system avoids creation of new peaks during system automatic load restoration - under system control or upon command. The TWACS load restoration system measures effectiveness by recording whether or not load is on at the time of shed cycle. It also minimizes the impact of inrush current that follows an extended outage by initiating cold load pickup.

COMPATIBILITY

The TWACS system is compatible with most residential and commercial meters including single-phase mechanical meters produced by all major manufacturers, several solid-state electric meters in their native protocols, nearly all water/gas dial encoders, and pulse generators/initiators. TWACS management software communicates with other utility computer systems and substations and is MultiSpeak™ II compliant for billing systems interfacing.

CUSTOMERS

DCSI's customers include ATCO Electric, Bangor Hydro-Electric, Florida Power & Light Co., Idaho Power, PPL Electric Utilities, Puerto Rico Public Power Authority, TXU Energy Delivery, Wisconsin Public Service Co., and over 180 electric cooperatives and municipal utilities. PPL's project is the largest two-way AMR deployment in North America, and FPL's TWACS Load Management program is the world's largest two-way PLC Load Control project.

SYSTEM EFFICIENCY & INTEGRITY

The cost-effectiveness of the TWACS system is unaffected by population density, terrain and service territory characteristics that typically limit or preclude other technology applications – and system-supporting infrastructure is already in place. The integrity of DCSI's system is an outgrowth of strategic research and development, superior design and production practices, and proactive technical service. DCSI maintains a strong avenue of communication with TWACS clients via an interactive "customer care" program and an annual Users Group conference. Whether the reason to install an automated system is operations efficiency, healthier cash flow, improved customer satisfaction, or the ability to apply multiple value-added services – deploying a TWACS system is an investment in the "future proof" tool for the industry.

DCSI

Distribution Control Systems, Inc. (DCSI) is located in St. Louis, Missouri, and manufactures and markets their Two Way Automatic Communication System (TWACS®) solutions utilizing power line communications (PLC) technology for utilities deploying automatic meter reading (AMR) and advanced applications. Over 8 million two-way devices are installed or under contract.

TWACS® BY DCSI

To learn more about TWACS®, call 888-892-2799. Or visit us on the web at www.twacs.com.

A POWERFUL LINE OF THINKING

This is your wake-up call... don't hit the snooze button!

By Michael A. Marullo, Contributing Editor

If you are 30-something or perhaps a little younger and you have parents who were (or possibly still are) part of the electric power industry workforce, you owe them a big thank you. Why? Because if you're not already aware, those individuals – and the rest of their so-called Baby Boom generation – were primarily responsible for creating the world's most robust and (so far) most reliable electric power network. No small task, to say the least, and one for which there has been far too little public recognition over the years. (If you doubt that, when was the last time you read an article about how well our power system has been working?)

In any case, there's a huge problem looming on the horizon that we all keep hearing about but that few are actually doing anything about - yet. That problem is our aging workforce, and it promises to be not only one of the most formidable challenges the power industry has ever faced, but also one that will be with us for many years (and generations) to come. The good news is that there is still time to react; the bad news is that too many utilities are NOT reacting and possibly won't until the ceiling comes crashing down on them.

According to a new survey by staffing giant Manpower Inc., three of the top ten hardest-to-fill jobs are engineers, information technicians and call center operators; all positions critical to the operation of any utility regardless of size, type or location. Moreover, three of the remaining seven areas experiencing shortages – sales representatives, administrative assistants and accountants – also play important roles throughout the utility industry.

Another survey of the public power workforce published by the American Public Power Association in 2005, entitled "Work Force Planning for Public Power Utilities: Ensuring Resources to Meet Projected Needs," found that half of responding utilities projected that more than 20 percent of their employees will be eligible for retirement between 2005 and 2010. "Skilled trades" were identified as the occupational group with the most likely retirements within that five-year span, as well as the most difficult positions to fill.

Some of the other highlights from the 2005 APPA survey include:

- 63% of respondents identified "skilled trades" as being among the utility positions with the most likely retirements over the next five years
- 52% of respondents indicated that vacancies among the "skilled trade" positions would be among the most difficult to fill
- 64% of respondents believe that retirements will pose either a moderate or very great challenge to their utility
- Twice as many respondents in 2005 believe that retirements will create a "significant challenge" for their utility than in the 2002 survey
- The most significant challenges created will be the loss of knowledge due to retirements, the difficulty finding replacements, and the lack of bench strength within the organization.

In my opinion, this last item is the real zinger! Loss of knowledge here does not just mean losing people with good educations. Although that is certainly also an issue as well, what it really means losing people with the implicit know-how to get the job done without having to look it up in a book, consult with others or resort to trial-and-error methods. This is about experiential knowledge, the kind that takes a lot of years – and often lots of mistakes – to accumulate. It is also the kind of knowledge that cannot be easily compressed into a crash course like an executive MBA. No, this is the kind of knowledge that only comes with time and experience, and a whole lot of that kind of knowledge is on the verge of going away forever unless we do something to preserve it.

Fortunately, there is a lot that actually can be done to keep from losing the vast pool of knowledge that is, in fact, the glue that has held the equipment, systems and devices together over the past 50+ years, often well past the manufacturers' specified useful life for those elements. How did we manage to do that, one might ask? Simple; by using good old imagination, ingenuity and innovation – the same techniques that we need to apply now before it's too late.

About two decades ago when I was still doing a lot of work in the process industries – right around the time that our domestic automotive industry was getting its wake-up call from Japan and Europe – I remember seeing quite a significant surge in knowledge-capturing technology in the industrial world. There were heads-up displays built into headsets, glasses or goggles and tied to belt-mounted microcomputers (among the first of their kind at that time) as well as expert system shells, software designed to enhance early rule-based expert systems. That period also saw rapid advances in the storage technology that would be needed to accommodate huge amounts of digitized information from service manuals, inspection logs and maintenance reports.

What happened to all of that? I would like to be proved wrong, but I wouldn't be surprised to find that we have a lot of young engineers in our ranks today that don't have a clue what I'm talking about. Even some of the more senior folks may have simply forgotten that this stuff exists or have written it off to theoretical nonsense. Still others may not even be aware of these tools because they were originally developed outside the tightly woven cocoon of utility R&D departments.

Whatever the reasons, it's time to take a look around to see what we can do to capture the knowledge that we have taken for granted for so long that we can't even imagine a world without it. Digital Web cameras and microphones that can see and hear what happens when "Fred" (or "Sally") goes out to Station 23 to tweak a relay and expert systems that can actually learn what works and what doesn't without having to blow up Station 23 are actually here… now, today. These things don't have to be invented or developed; they just have to be used and properly applied.

There is a catch, however. You have to find every Fred (or Sally) in your organization and make sure that you connect them to these tools. Don't wait too long though, the clock is ticking and Fred and/or Sally won't be around in just a few years from now. So, let me make the message clear: Wake up before the most important part of our workforce goes to sleep forever – and whatever you do – please don't hit the snooze button; it could cost a lifetime of progress. ■

About the Author

Mike Marullo has been active in the automation, controls and instrumentation field for more than 35 years and is a widely published author of numerous technical articles, industry directories and market research reports.

An independent consultant since 1984, he is President and Director of Research & Consulting for InfoNetrix LLC, a New Orleans-based market intelligence firm focused on Utility Automation and IT markets.
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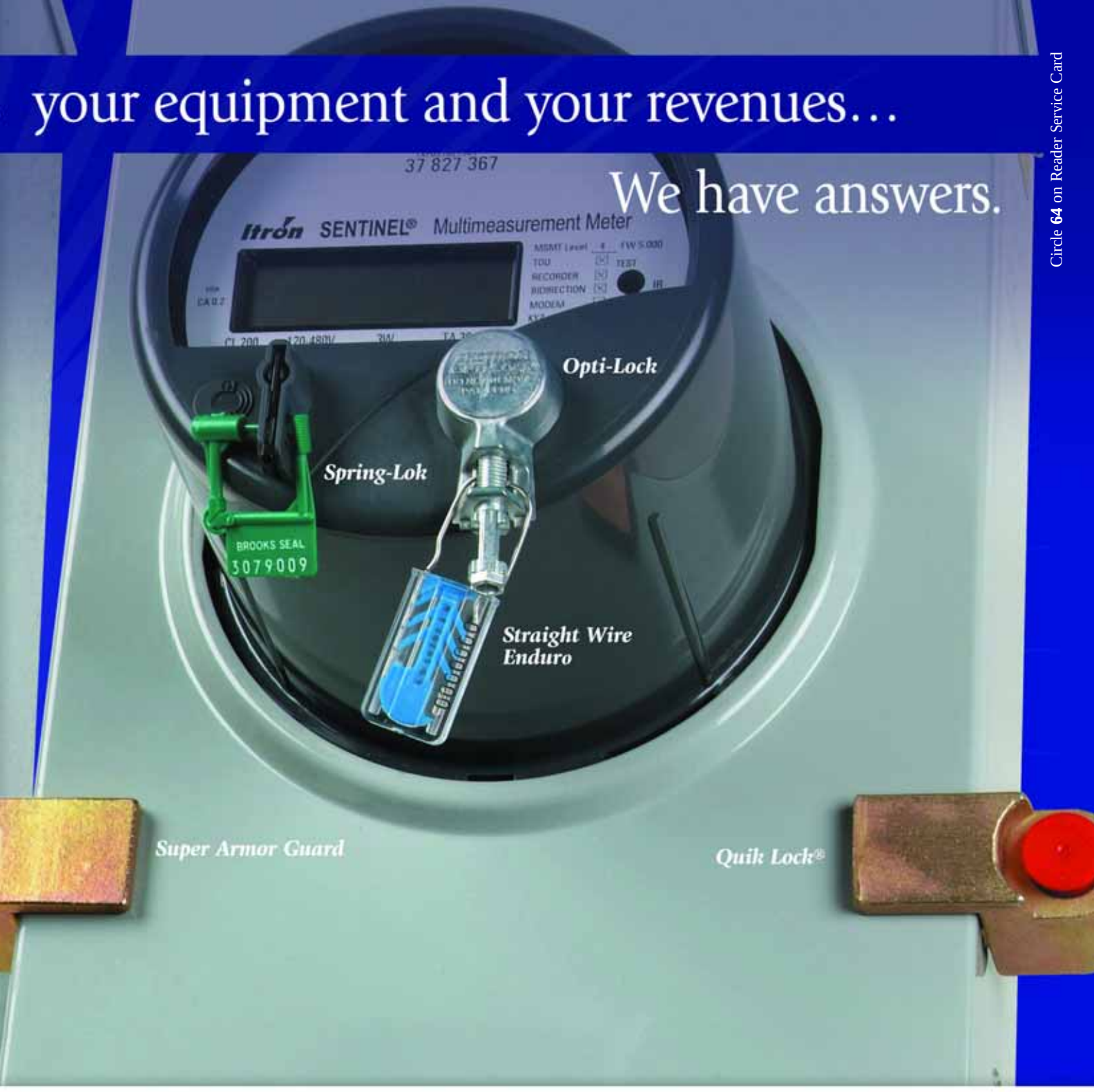

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Strategies to Consider When Implementing AMI

By: Bill Zorn, Electronic Data Systems (EDS) Energy Industry Executive

Change is a constant state in the world today. Utilities are facing changes on a scale they have not faced since the 1900s. New technologies, merger and acquisition activities and government regulations, all mean significant change for utility companies. A number of utilities are looking at implementing advanced metering infrastructure (AMI) as a way to improve overall business operations as well as meet the Energy Policy Act of 2005 (EPAct) mandating "energy efficiency" on all levels.

Sometimes referred to as "smart meter" or "automated meter reading," AMI is simply the use of digital technology to collect, synthesize and report data for billing purposes rather than the former labor-intensive, manual methods. It allows utility companies constant two-way communication with their commercial, industrial and residential meters, which is essential for improving customer service, reducing operational costs and positioning for growth.

EPAct 2005 is creating even more pressure for utility companies. The act, signed in August of 2005, provides utility companies with incentives to improve traditional energy production, as well as find new and more efficient energy technologies to meet the long-range conservation effort. EPAct will force many utilities to transform metering and demand response systems, but the key will be to develop a long-term strategy on an adaptable infrastructure.

Although AMI is not a new idea within the industry, it is very much top of mind for many utility companies today. Although implementation costs may be high, the benefits of managing meters remotely far outweigh the price tag to implement an AMI solution.

The Benefits of AMI are Evident

Even though AMI was developed more than 10 years ago, the demand for "energy efficiency" by both the government and consumers is making it a reality. It is truly becoming the most effective way for utilities to replace the sometimes inaccurate, labor-intensive process of physical meter readings. This, combined with diminishing natural resources and a need to reduce operating costs, has made AMI an important consideration for future operations. In fact, many states are pushing utilities to offer consumers more options for reducing overall power consumption.

The following is a snapshot of the benefits that have been identified and well-documented for implementing AMI:

- AMI improves the process of managing demand for natural resources allowing the utility to offer consumers incentives for selective load control.
- Making educated assumptions about future usage is the most imperative data collected by AMI. It provides information about factors that stimulate peak consumption, which can be translated into business strategies such as proactive load management, outage prevention and consumer incentive programs.
- It also enables utilities to implement pricing structures that offer incentives for efficient energy users, so peak energy users are charged more and efficient users no longer subsidize inefficient users. By monitoring almost real-time usage, utilities can ultimately help customers save money on their utility bills.

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- Automated, remote data collection streamlines back office processing for billing, asset management and outage management. The automated data transfers improve meter reading accuracy which ultimately reduces customer complaints.
- AMI reduces the number of steps between consumer usage and bill distribution, so utility companies yield cost savings by significantly shortening their billing cycles.
- Rather than customers having to call in and experience long hold times, AMI can proactively provide customers with information regarding outages. Another way call center activity and related costs are greatly reduced is decreased data entry errors, which in turn reduces billing errors and customer disputes, thus reducing customer calls.
- AMI technology offers utility companies valuable insight into customer usage, including consumption behavior, effects of external variables and outages. Data collected at 15-minute intervals can be used for profiling usage, time-of-use data, demand management and phase-load balancing. The overall results are improved quality of service and shortened response times to outages.

The benefits of AMI can be seen in all areas of the supply chain. Automation alone can lower costs related to billing, meter reading, call center activity and demand response. However, the risks associated with a large-scale deployment of AMI are considerable.

Despite these risks, utilities are being forced through competitive and regulatory pressures to deploy AMI systems. It is important for utilities to understand the risks involved, in order to minimize them, while maximizing their return.

AMI's Biggest Risks

Initial Capital Outlay and its Effect on Cash Flow

A major risk utility companies contend with when implementing the new infrastructure is the amount of capital required and the subsequent effect on the utilities' cash flow. AMI usually requires a large capital expenditure initially for the meters, data concentrators and the labor to install them, as well as the software, hardware and communications required to run the system. That expenditure can decrease if there is a rate increase approved to support it, but cash flow is still an issue.

Potential Interruption and its Effect on Revenue

More importantly, utilities can not afford to stop or even slow down operations for a new implementation. Since meters directly impact a utility's revenue, the risk of changing technologies and processes means shutting down the utility's source of collecting that revenue. The implementation can also be a drain on "people resources" because there is usually a small army of key utility staff members devoted to the project.

Some problems are inevitable in any large implementation, but there are ways to control costs associated with the implementation of a new infrastructure.

Strategies to Address AMI's Risks

Metering Technology

The bad news is the AMI technology, including meters, concentrators and head-end systems, is the largest cost component of a large deployment. Experience tells us this cost category is usually 35-40 percent of the total cost of deployment.

The good news is, in the long-term, this digital technology will continue to improve in functionality and decrease in cost. Take the evolution of personal computers costs as an example. When PCs first came out in the early 1980s, they cost at least $10,000. There were a number of proprietary hardware components that were unique to each manufacturer. Today, good PCs can be purchased for less than $500 with a magnitude of

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SOLUTIONS THAT MATTER

functionality far greater than their predecessors and are now equipped with mostly interchangeable components.

Digital metering technology will evolve in the same way, so metering technology should be treated as commodities. Utility companies should recognize there will be multiple metering systems as a result of geographical or topological concerns, as well as realize metering technology will continue to evolve and improve functionality. The metering technology implemented in the beginning will not be the same at the middle or end of the implementation. As a result, it is best for utility companies to not get tied to a particular metering vendor or pay for another utility's deployment by purchasing its metering solution. Utility executives should buy from a reputable meter manufacturer that meets the company's functionality needs at the lowest cost.

Networking Solutions

The key is to evaluate different local area networking (LAN) solutions for different population densities. There are several good LAN technologies. For example, PLC, RF and RF-mesh are currently available and more, such as BPL, are coming. Each has different technology issues and costs to consider.

PLC technology is great for rural and urban areas with large buildings. RF-mesh solutions are extremely cost effective for suburban areas. Most utility companies will need to use a mix of these technologies in order to minimize the LAN networking costs.

On the other hand, Wide Area Networking (WAN) costs are commodities and should be treated as such. Utility companies should not get locked into long-term contracts with communications companies. Prices will continue to drop. The concentrator technology chosen must have the ability to use different modems, including phone, cellular, even satellite, and be replaceable when the price is right.

Meter Data Management

Meter Data Management (MDM) is the most important part of the architecture when aiming to keep costs low. A meter data management system that runs on multiple architectures, such as Windows, UNIX, and Linux, must be selected. It is best to purchase a MDM system from a company that does not make meters – unless the plan is to use only one type of metering system for the entire deployment (please refer to the above section on "Metering Technology" explaining why agility is important). An independent software house usually has more incentive to be open to communicating with any meter manufacturer's head-end system. Also, installing the meter data management system before any meters are deployed will allow utility companies to input current manual or handheld readings. It is imperative to then build interfaces to production systems so when the first AMI meter goes into production, the business benefits are realized immediately.

Additionally, the system must be scalable enough to handle the current and future meter population such as growth resulting from merger and acquisition activities. The MDM system chosen must also have a track record of success – the utility's future should not be dependent upon a product that has not been tested widely in the marketplace.

Legacy System Interfaces

An enterprise application integration (EAI) tool should be utilized if it has already been established – especially for all near real-time and real-time interfaces. Large volume interfaces, like billing systems, should still use batch interfaces. If an EAI tool has not been put into operation, utility companies should consider installing one in conjunction with the AMI deployment. In the long run, it will save time in coding and related costs.

There are several good EAI tools in the marketplace today and each has a slightly different set of advantages – but AMI should not drive the decision regarding which EAI tool is chosen since many are highly adaptable for easy use with AMI. An EAI tool should be selected because it meets the enterprise-wide objectives and needs.

Additionally, the overall project management aspect, from beginning to end, is critical to AMI success at a utility company. Whether the company chooses to implement AMI in-house or through a service vendor, it is imperative a master plan, including the IT blueprint, is in place and the executive management is committed to that plan and understands the enterprise-wide benefits.

In summary, utility companies deploying AMI will certainly face risks. Employing some of the strategies noted above can help minimize those risks and help utilities reap the advantages of implementing AMI. ■

About the Author

EDS Energy industry executive Bill Zorn specializes in Advanced Metering Infrastructure (AMI). With more than 28 years of delivery, sales and consulting experience in systems and services, Zorn is considered a subject matter expert in Automated Meter Reading (AMR) and Advanced Metering Infrastructure (AMI). In addition to his expertise in the energy industry, he has considerable expertise in the manufacturing industry as well as experience in corporate and divisional business planning, management, sales, delivery and consulting.

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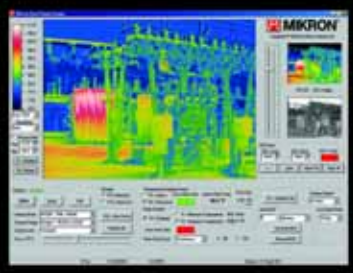

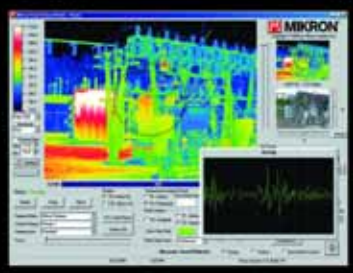

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THE AGING WORKFORCE IS MORE THAN AN HR PROBLEM

By: Brad Kitterman & Jack Dugan, LogicaCMG

Conventional thinking considers the aging utility workforce a critical problem demanding a call to arms. Although the demographics are more pronounced within the utility industry than in many other businesses, the seemingly harsh reality of a disappearing workforce – disappearing principally because of retirements, but also because of cost cutting measures and hiring competition – confronts all types of businesses worldwide.

But is an aging workforce a Human Resources dilemma alone? Or is it more broadly a window through which utilities can examine ways that they can foster positive change for the future of their organizations? The exit of a large cohort of skilled workers may represent the most significant opportunity a utility will ever have to confront and fundamentally alter how it carries out its business and upgrades its financial performance.

At most utilities, little or no opportunity for significant revenue growth has existed for some time while increasing personnel related expenses have continued to squeeze profit margins. To achieve the annual earnings improvement targets of 10 – 15% their stakeholders have expected, utilities have had no alternative but to reduce ongoing operational expenses dramatically, and often that has meant cutting staff.

Impact of a Disappearing Workforce

Within ten years, up to 50% of the utility workforce of today will have retired, taking much of their experience and culture with them. How will utilities make up the deficit?

But the dramatic cutting of expenses based on typical cost reduction strategies is all but over. With nearly a third of the industry eligible to retire today or within the next five years, further personnel cuts aren't warranted. Utilities now have the unique possibility of making business improvements that can reduce future costs. One approach involves the use of innovative technology to drive improvements like these:

- Lessen headcount requirements and make better use of reduced staffs
- Capture the knowledge base of skilled workers before they depart the workforce
- Reduce the number of people involved in getting work done by improving data access and communications between operating units
- Place emphasis on the availability and use of key skills rather than on total numbers of personnel
- Create true "best practices" instead of using "status quo practices"
- Develop a "digital organization" that excites and retains new hires

Utilities that are successful in the future – the high performance utilities – will not be able to hire their way to successful performance. There will be fewer skilled workers available for hire, recruitment will remain costly, and ongoing

personnel related expenses will continue to escalate. The high performance utility will institutionalize (capture existing employee knowledge about) its key procedures and business processes, and exploit documented best practices before employees fly out the door. The high performance utility will succeed by challenging accepted ideas of business as usual and finding new ways to perform and improve on its core business despite staffing challenges.

Forward-looking utilities must invest in strategic technology, using a variety of partner models to meet their requirements. Technology solutions that solve localized issues will not address the future. Solutions that look at a utility horizontally, as an organization with many parts that need to perform as a single entity, will be an important means to deal with the disappearing workforce.

WHAT ARE UTILITIES LOSING? AND GAINING?

Of the major issues confronting utilities today (expense reduction, industry consolidation, regulation and business process standardization), the imminent loss of critical skills and the knowledge base of an aging workforce approaching retirement represents a demographic tsunami, a force unprecedented in business history. During the next five to ten years, many utilities will lose 50% of their current workforce to retirement, and no job classification is immune. Clerical and administrative staff, as well as field technicians, managers and supervisors, engineers, IT personnel and business executives, will all be part of the retirement wave.

Utility workforce retirement is more profound than personnel turnover because it represents a loss of critical knowledge. This knowledge base embodies the art of the organization, and not just the information that is explicitly documented in manuals, maps, procedures and databases. Also it incorporates the organization's culture and attitudes.

As the aging workforce leaves and is replaced by younger workers, utilities face a potential fracturing of the motivational belief system that once bound the workforce to common goals. So that new workers can meet the utility's objectives, they need the expertise and knowledge of prior generations of workers available to them. Working with past knowledge, the new workers can add their own motivations and the utility can gain a new and positive culture for success.

CONVENTIONAL SOLUTIONS

Industry literature suggests a number of solutions to the aging utility workforce problem:

- Long term staffing plans
- Partnerships with universities and community colleges
- Continuing education and training programs
- Active involvement in industry organizations
- Internal knowledge sharing programs

Each of these approaches has a role to play. But collectively, these approaches likely will not suffice to lessen the impact of half or more of a utility's workforce leaving. The number of students enrolled in college math and science programs, except for computer and information sciences, continues to decline. In the last 15 years, colleges and universities have seen a 50% decline in the number of graduating engineers, one of many skill sets a utility requires. As utilities lose their skilled workers, those skills are not being replaced in the labor pool. Solutions other than hiring programs will be needed to bridge the gap between skills lost and skills needed.

THE ROLE OF TECHNOLOGY

Much of the technology utilities have implemented over the past five to ten years has been represented by "point" software solutions. By solving specific and limited problems, this software has tended to reinforce status quo ways of doing business rather than enabling innovation or better problem-solving.

In many utilities, the status quo means a vertical organization, that is, a group of departmental silos that define the utility's corporate structure. In a vertical structure, each group or department operates as a somewhat isolated entity, and each group "owns" the work to which it is assigned. But the manner in which utilities conduct business is comprised of horizontal business processes spanning the office and the field, processes that are driven by the customer, whether commercial, industrial or residential.

Thus vertical organizations often inhibit changes that can reduce headcount requirements and ensure better communication among remaining personnel. But changes that help flatten an organization horizontally – so that operations and procedures are viewed from end to end – can streamline business processes to improve hand-offs between job roles and eliminate time-consuming and labor-intensive administration steps.

In the future, high performance utilities will of necessity implement horizontal business process solutions that involve multiple systems spanning what were once organizational silos such as customer service and distribution operations. Horizontal solutions represent a quantum change in project complexity that will stretch many utilities' internal organizations and define the systems integration market in the future.

The major opportunity offered by an integrated, horizontal solution is to create a strategic technology platform that offers the benefits of positive change and value creation. Such changes are critical to supporting a utility as it undergoes workforce attrition and cultural evolution due to workforce retirements. The following represent some of the opportunities for change that high performance utilities should be reviewing now for implementation.

• Business Process Change Opportunities

The term best practices has sometimes come to mean a generic methodology or a detailed scripting of events rather than an organized, documented view of what is truly the preferred and streamlined way to carry out a particular procedure. Many major technology initiatives and systems implementations have failed to deliver value to the utility because the "best" practice is never defined, and therefore the transformation of the business process never occurs. The pressure to reduce costs and the rush to adopt scripts of existing procedures primarily accounts for this disappointment.

Conventional solutions

such as support for educational programs and internal knowledge sharing have a role to play in replacing the disappearing workforce, but they cannot do the job alone.

To be successful, the high performance utility of the future must establish a strong strategic technology platform that enables the organization to unify its people and business processes ***horizontally.***

The high performance utility of the future must make a commitment to define accurate best practices and commit to a program of continuous process improvement. Such a program continues to drive costs out of the business by simplifying and standardizing business processes, eliminating paperwork and redundant data, reducing personnel interface points, and viewing a utility's operations from office to the field as the single continuum. A strong strategic technology platform can support the capture and reinforcement of these standards.

• Design Engineering Opportunities

The average investor owned utility in North America has more than 50 design engineers architecting construction work undertaken by the utility. The design of such work involves significant systems support: a GIS and a graphical work design interface that links the GIS to a work management system. The intermediary application, the design manager, also ensures that as the engineer renders a design, the accompanying work order in the work management system accounts for the compatible units implied by the engineer's job design.

Much of the construction work and underlying design work undertaken by utilities is repetitive. Such repetitive work, particularly for light or medium construction activities, lends itself to design templates. It is conceivable that the use of design templates can accommodate as much as 80% of the design engineering workload. The development of a best practice based on standard designs for discrete types of work, and institutionalizing a standard design as a replicable template for the engineering department, can reduce the utility's dependence on an increasingly limited supply of talented engineering labor.

• Scheduling and Dispatching Opportunities

The average investor owned utility (IOU) in North America has more than 700 field crews serving trouble response, customer service, maintenance and construction activities. Although job function definition and responsibilities vary among utilities, the roles that manage the deployment of the field crews may be defined as (1) schedulers, (2) dispatchers, (3) administrative personnel, and (4) field supervisors; all of these individuals may actively schedule or dispatch the field workforce, even within the same utility.

How does integrated technology help?

- ***Optimize operations through the use of an advanced scheduling platform.*** With Work Scheduler*Plus*, a scheduling solution within LogicaCMG's asset and work management product suite, a utility can assign work horizontally, according to the availability of key skill sets, rather than according to rigid vertical silos.

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The same average IOU has as many as 60 FTEs, approximately one for every 12 field crews, involved in scheduling, dispatching, monitoring and otherwise administratively supporting the field workforce. The staff handling these tasks is often functionally, organizationally and geographically dispersed. The functional and organizational dispersion is directly attributable to the point software mobile applications that

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mirror the organizational silos that acquired the applications. Typically each piece of software addresses one job type: emergencies, customer service, maintenance or construction. Accordingly, each department has multiple staff scheduling or dispatching each respective type of job.

This kind of environment spells opportunity for a utility that is faced with a shrinking workforce. A single dispatching technology can have immense cost-reduction implications which include reducing redundant job roles.

The scheduling of field personnel can also be worked into a single dispatch strategy. Utilities need one view into all work – one centralized organization of super users exercising sophisticated scheduling/dispatching functionality – a kind of utility command and control center for scheduling and dispatching all work. The right strategic technology platform incorporates significant business intelligence, understands job dependencies, employs least cost routing, and continually provides the super user with an optimized schedule throughout the workday. As the scheduling software assumes more of the scheduling responsibility, the 60 FTEs formerly required by an average utility become unnecessary, thereby eliminating a major staffing concern.

• Wireless Opportunities

For the last two years in North America, utilities have issued more RFPs for mobile workforce management than any other application domain. All of the top 100 North American IOUs have some form of mobile deployment in place. However, these applications are point software solutions that address one job type, such as trouble, and they do not support a horizontal dispatching and scheduling function. Further, many utilities lack an overarching wireless strategy and platform that isolates devices, networks, back office and mobile applications from the vagaries of rapidly accelerating wireless technology to fully mobilize the workforce.

Utilities require a plug and play wireless communications architecture that (1) manages the flow of data between the office and the field, (2) maximizes the bandwidth / throughput of existing utility RF radio, wire line and wireless networks, (3) assigns priorities to time sensitive data, and (4) provides least cost routing (network choice). This is a complex undertaking, and today there is no generic plug and play platform that manages field workforces in this way. The architecture of a universal communications platform (dispatch) that manages all types of work is the holy grail of the network connectivity business. No utility has this capability today.

A universal architecture will allow the utility to plug and play back office and mobile applications as required to broaden the footprint of work conducted wirelessly in the field. A universal mobile application controller that manages all types of work is the application that will power the future of mobile computing. No utility has this capability today, either. In addition to application and network independence, the utility's wireless enterprise strategy must accommodate the management of multiple field devices, and the supporting server and communications hardware/middleware environment.

An integrated universal communications platform must be viewed as the next technology that will afford utilities further opportunities to lessen their dependence on headcount. The technologies that support such a platform are being created now, and to blunt the impact of a disappearing workforce, high performance utilities need to begin partnering with systems integrators who can bring these technologies to the table.

Utilities can optimize

or make the most of, their people, processes and technology by seeking out partners who will share utility risk and reward in a program of continuous process improvement.

THE FUTURE OF TECHNOLOGY: SOLUTION OPTIMIZATION

The next significant strategic technologies implemented by utilities will be those that optimize solutions and processes. They will help a utility institutionalize the knowledge of seasoned employees and incorporate that knowledge within documented, sustainable best practices. Further, new strategic technologies will help the utility evolve best practices over time through a program of continuous process improvement. Also, the new technologies will provide the utility with ways to most effectively use both new and existing applications to perform work across the entire horizontal utility organization.

Instead of tactically buying enabling technology such as software, utilities will strategically partner with organizations that can deliver technology that creates value within the utility. Utilities will increasingly seek partners who own the business result, not simply the process or the IT infrastructure. Such partners will share utility risk and reward in a program of continuous process improvement, as they and the utility constantly refine and optimize solutions.

CONCLUSION

In ten years, what will the high performance utility look like? It will have fewer employees and more new faces. It will have lost much of the culture it relied upon to drive its business forward. But if it makes the right plans today, tomorrow it will have gained a new culture that takes advantage of the best of the old knowledge combined with the advantages of a new strategic technology platform. The new platform will unite all segments of utility operations within a single set of business goals. A workforce that is disappearing due to retirement doesn't need to spell disaster if a utility takes steps now. These steps include applying conventional hiring approaches, embracing new technology and seeking out vendor partnerships to help unite and optimize the utility's work processes. ■

About the Authors

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LogicaCMG is a global IT solutions company, providing systems integration, consulting, products and services. LogicaCMG's Asset & Resource Management (ARM) product suite includes work management, mobile computing, asset management, compliance tracking, dispatch, scheduling and reporting capabilities delivered as a pre-integrated, seamless solution.
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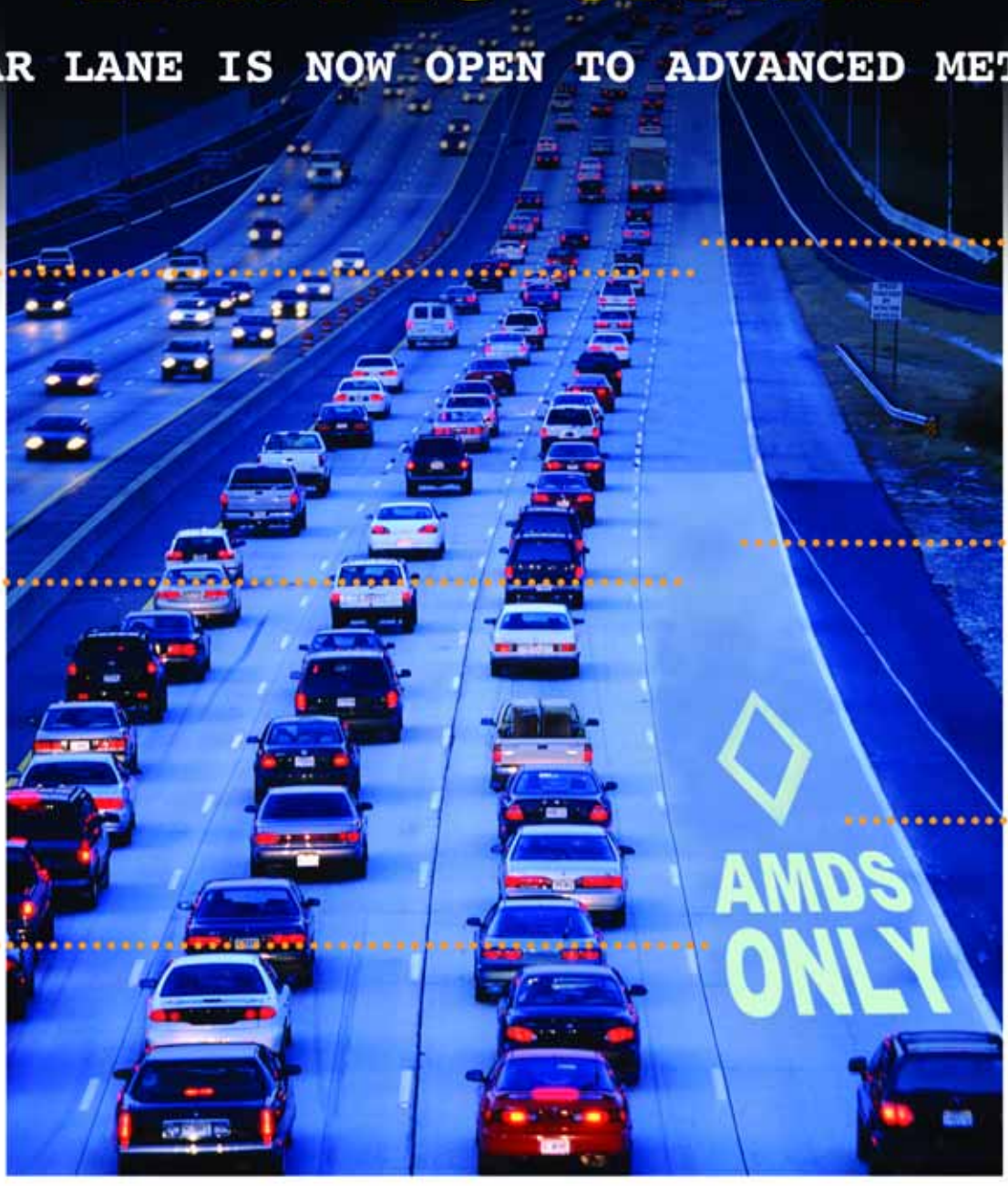

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An Integrated MDM and Billing Solution: Managing Energy Consumer Behavior and the Complexities of Recent Industry Initiatives

By: Joven Luspo, Senior Sales Engineer, LODESTAR Corporation

Energy supply – or lack thereof – has been a fundamental challenge of energy providers in recent years. Compounded with the rising cost of fuel, heightened environmental concerns, and an ever increasing global population, managing the balance between our energy supply and our energy demand has become increasingly complex. In an attempt to counter some of the current industry challenges, some markets have resorted to creative means in order to curb our energy appetite.

According to a recent report by Energy Insights, an IDC company, the US Energy Policy Act of 2005 contains multiple provisions dealing with time-based rates, smart metering and demand response. It requires that utilities and retail energy providers offer and provide all customers, upon customer request, with time-based rates within 18 months of enactment. Additionally, utilities and energy retailers must provide a time-based meter to any customer requesting such a rate. The section also requires State public utility commissions to conduct an investigation into time-based metering and communications and issue a decision on whether or not it is appropriate for electric utilities to provide and install time-based meters and communications devices for each of their customers. This, coupled with other provisions that direct the FERC and the Department of Energy (DOE) to conduct studies related to demand response, will most likely result in a number of States adopting mandatory requirements for smart metering. Energy Insights expects these provisions to significantly accelerate the deployment of smart metering systems which include solid-state meters, two-way communications networks, and meter data management applications.

Further complicating the issue is the amount of energy we consume these days. At the same time that generation plant construction dwindled due to emission concerns, our energy consumption requirements increased. As a society, we consume much more than our parents did. We have larger homes, bigger televisions, and more appliances, for example, to make our lives easier. The growth in population multiplies the already increased energy consumption. What's more, many of the same people demanding legislation of energy production, own many of the same "necessities" as everyone else.

One way to balance the energy scale is by enticing consumers to get smarter and more responsible about using power through managing their own consumption. There are initiatives in the marketplace that suggest–or even mandate–to measure and price consumer's usage at an hourly or even sub-hourly level. Different prices throughout the day mean that not only do we pay for the energy that we used, but we also pay for when we used that energy. The goal is to alter consumer's energy usage behavior by shifting their high-energy activities to periods when demand is lower. This, hopefully, also promotes a more conservative consumer. When consumers understand how they use energy and when it is more cost effective to do so, they will ideally use their energy when financially motivated. If enough of us change our behavior, lower efficiency and higher cost generation plants will not have to come on-line as often in order to satisfy the demand.

The optimal way utilities will be able to work within these market trends or mandates is with an integrated MDM and Billing system. Such a system can quickly apply hourly or sub-hourly prices to usage and accurately calculate bills. (A classic billing solution is too simplistic to be able to manage the hourly data with different price points.) When prices begin to rise during the day, an integrated system can apply these prices to the consumer's forecasted usage and signal consumers of a possible impending excessive energy bill. Such a system can also be used to detect possible revenue protection violations due to energy theft. Complex filters may be installed to identify and alert users when these revenue violations are suspicious or even absolute. It can also analyze consumption patterns and warn users of possible revenue violations. Revenue protection functionality protects the company from revenue violations or theft by allowing utilities to analyze consumption patterns and flag those who are outside of defined tolerances.

Currently, many industrial customers and large commercial customers use advanced interval meters to support real-time optimization of energy usage and complex billing contracts related to demand response. Also, interval metering samples of all customer types have been used for 25 years to develop fair and equitable energy prices based on actual cost-to-serve each customer type. However in North America, most residential and commercial meters do not measure usage on an hourly basis, although discussions about smart metering are underway in California and Illinois. The one exception is in Ontario, Canada where smart metering has been mandated to replace all electric meters with smart meters by 2010. Once smart meters are installed, and much more data is being measured, the next step will be pricing the energy on an hourly basis. Although an exciting and promising solution to the energy supply concerns, the influx of data and complexity of pricing and billing present a challenge to utilities that is daunting.

Let us not forget about the Sarbanes Oxley Act and its requirements as it relates to data management. It requires accountability in changes to meter data. More specifically, software housing meter data needs to include auditing features to document the who/what/when of all changes. Utilities should include this functionality as part of their requirements.

And foremost, with the constant change in market rules, the system must be flexible enough to adapt to these changes without upsetting the balance already in place. Software with hard coded rules will prove to be inflexible and not as cost effective as a flexible solution that is easily adapted to the changing and future market rules. Utilities need the flexibility to add reports and processes at any time. Likewise, a system that is not scalable or is incapable of keeping up with the pace of the rising amount of data, will also prove to be a burden. With a scalable and flexible system, utilities will avoid costly reinvestments. The technology should not limit the number of interval meters, customers or complexity of validations. The system should easily integrate with other systems, leveraging the investments that are already made. Overall, utilities should

require the infrastructure that supports their business needs as they exist now and as they evolve over time.

Aside from these basic functions, utilities should require other specific functions in an integrated MDM/Billing system. First, the ideal system must be designed from the start to manage high volumes of data. After a few months or years in operation, improperly designed systems will begin to exhibit poor performance. The market will dictate multi-years of data to be available on-line so that customers have access to the same information, and in case any disputes arise. Utilities must be prepared for this. Once designed to manage the data, the system must have the ability to store and process the high volume of data required. Not as easy as it sounds since as the volume of data increases exponentially, so does the volume of errors. It becomes clear, then, that the validation process is critical. The industry enforces standard validation rules, for all meter data, and the ideal system must adhere to these rules. The system must be able to quickly identify and apply market rules to the data to either automatically cleanse the data or raise an exception. It is essential that the system minimize human intervention to these exceptions. Humans are prone to making more errors. We are also increasingly reminded of the concept of "doing more with less." This validation process identifies potential lost revenues, provides more accurate data with audit ability, and provides viewing and presentment capabilities. The system must manage and resolve exceptions associated with anomalies and usage data to proactively identify areas of lost revenues and to provide decision support to capitalize on revenue opportunities.

In a decentralized market, consumers have more choices from whom to buy their energy, therefore accurate information becomes a lot more critical. Utilities can't afford not to have accurate and clean data that can be used for revenue protection and billing calculations. The benefits for such a system are abundant:

- Elimination of manual billing processes – delivering invoice ready data for billing, and internal users and external customers will be provided with enhanced meter/cost data web presentment tools
- Minimized project risk as utilities become capable of embracing and implementing new requirements within specified timeframes
- Maximized return on investment
- Lowered total cost of system ownership
- Increased sales opportunities
- More accurate forecasts
- Reduced market risk
- Accelerated revenue
- Reduced customer service costs.

The advantages of such a system spill over into other areas, as well. For example, utilities can use the vast data warehouse to mine the information for future initiatives not yet defined. They can forecast how much energy they will require in using historical information and analyzing trends in geography and population growth. They will also be able to use this information for distribution planning purposes, thus enabling energy companies to plan for future equipment needs within the distribution network. This type of planning could save companies millions in equipment purchases by extending the service life of equipment and at the same time improving the efficiency and reliability of their network.

The energy industry transition to hourly usage information, dynamic pricing and consequently customer-controlled demand responses is a natural transition to open and competitive markets. As has been experienced in all prior monopolistic industries, increased innovative customer options will come with a more efficient market, which in time, has proven to lead to reduced costs. ■

About the Author

Joven Luspo brings more than 20 years of experience in the energy industry to LODESTAR. His primary responsibilities are to understand client technical and business needs, and to demonstrate how LODESTAR solutions and products meet those requirements. Mr. Luspo is fluent in the entire LODESTAR(R) Customer Choice Suite(TM) (CCS(TM)) product line and has been a principal in several LODESTAR integration projects. His role as a Senior Sales Engineer includes analyzing and resolving client issues, providing product training, and responding to client product requests.

Mr. Luspo began his career in 1980 as an engineering student while working for the Houston Lighting & Power Company. His last position prior to LODESTAR was Training Manager at Automation's Energy Management (ABB) division, where he was responsible for managing and conducting technical training courses for its global clients. Mr. Luspo performed a variety of roles in the 14 years he was with ABB including a power systems application software developer, database administrator, and product consultant. Mr. Luspo studied Electrical Engineering at the University of Houston.

Two AMI Business Case Tools to Boost Your Utility's Performance

By Garrett Johnston, consultant, KEMA

A critical challenge for maintaining the growth of the automated meter reading/advanced metering infrastructure (AMR/AMI) industry is to supplement recent trends in regulatory incentives with additional utility performance drivers. The industry must develop additional tools that help to more effectively assess AMR/AMI benefits for standard business case analyses, with or without the need for regulatory or legislative policies like those provided in California and Ontario.

That is why utilities can never have too many tools to fully analyze the high potential value of AMR/AMI investments, given changes in price points and advances in technologies and functionality. Among others, there are two insightful tools – one a metric and one a physical device – that may offer additional benefits to utilities in exceeding financial hurdles and gaining AMR/AMI investment approval.

Those tools: a Balanced Scorecard and an under-the-cover disconnect switch.

How would you like to demonstrate to your utility's top executives how your metering unit is improving performance every day – not just in your unit – but throughout much of your utility?

The Balanced Scorecard can help illustrate just that. Generally speaking, a Balanced Scorecard is designed to measure how effectively a company's daily activities support its long-term strategy.

The Balanced Scorecard can demonstrate how utilities can help all stakeholders, from employees to customers to shareholders, despite their divergent needs. The Balanced Scorecard has a four-level hierarchy, each of which measures improvement and provides direct benefits to the metric above it. (See graphic beside for details.)

Utilities can use a Balanced Scorecard to demonstrate how AMI can improve performance and enhance your utility's ability to be a "learning" organization.

For example, a utility could develop Scorecard performance metrics in the following areas:

- Customer Satisfaction
- Reliability
- Profitability
- Cost Efficiency
- Revenue Assurance

The Balanced Scorecard?

▲

Financial

Has our financial performance improved?

AMI Benefit:

More efficient distribution operations

▲

Customer Satisfaction

Do customers recognize that we are delivering more value?

AMI Benefit: Faster response to customer usage inquiries and nested outages

▲

Internal Processes

Have we improved key business processes so that we can deliver more value to customers?

AMI Benefit: Increased meter reading efficiency and accuracy

▲

Learning and Growth

Are we maintaining our ability to change and improve?

AMI Benefit: Increased information about customer usage

[1] Managerial Accounting, 11th Ed., Garrison, Noreen and Brewer, p. 58. McGraw-Hill.

AMI can provide numerous benefits in these, and many other, areas – all of which can be demonstrated through the Balanced Scorecard. (See graphic below.)

AMI Balanced Scorecard

Here's how an advanced metering fixed network can improve utility performance, as measured with 5 Balanced Scorecard metrics.

Customer Satisfaction

- Virtually eliminate meter reading errors and estimated bills
- Facilitate customer-specified billing due dates
- Provide advanced service options
- Access on-demand reads or viewing of recent usage data by customer service representatives in response to billing inquiries

Reliability

- Improve outage management – verification and reduced restoration times – through "last-gasp and power-up calls"
- Improve system planning through increased knowledge of daily and/or hourly usage on equipment such as transformers
- Proactive maintenance management and asset management with more refined load data down to the transformer level
- Improve ability to expand remote monitoring of customer power factor

Profitability

- Reduce outstanding collections amounts via remote disconnect/reconnects
- Reduce unbilled consumption via on-demand reads
- Increase the meter read to bill cycle time via on-demand reads
- Improve revenue forecasting – provide mid-cycle revenue estimates, reduced estimated bills, for example

- Improve detection of "nested outages" – that is, a smaller outage within a larger outage – thus reducing outage time and improving efficiency of dispatching work crews

Cost Efficiency

- Improve meter reading efficiency
- Improve load survey information, eliminating need for separate survey meters
- Remote reprogramming of meters to avoid costly field visits
- Reduced maintenance of meter batteries – no batteries to maintain on TOU meters since the network keeps track of time
- Standardize / upgrade meter asset base
- Reduce customer calls from reduction in estimated bills and ability to settle high-bill disputes over the phone
- Reduce reliance on or eliminate existing data acquisition systems

Revenue Assurance

- Offer innovative pricing and demand response options to customers
- Provide real-time energy information for supplemental fees
- Increase portfolio offerings with advanced communications services
- Offer remote reading of other utility meters (e.g., gas, water)

For example, utilities can improve profitability by reducing outstanding collections amounts via remote disconnect/reconnect or unbilled consumption via on-demand reads. (More on remote disconnect below.)

They can also improve customer satisfaction by using AMI-collected data to provide instantaneous responses to high bill inquiries. With a fixed network AMR/AMI communications infrastructure, a customer service representative can quickly obtain a customer's recent usage and identify days of high usage. Such data often reminds customers of the reasons for recent high usage, such as a party they hosted or a weekend when the children were home from college, potentially eliminating the need to send personnel to re-read or check the meter. This type of quick response also demonstrates to customers that the utility generally knows what it is doing and is aware of what is happening on its system.

AMI as a strategic tool

Nova Scotia and at least one large, eastern IOU use the Balanced Scorecard to measure performance. The objective of the Balanced Scorecard: goal alignment. Nova Scotia first used the Balanced Scorecard to measure new goals that were implemented in 1996. Since then, the Balanced Scorecard has become a mainstay at the utility, states a case study developed by Paul Niven's Scorecard Academy. All of the utility's goals are measured through the step-by-step measures used in the Balanced Scorecard, states the case study.

The Balanced Scorecard can exemplify AMI's prowess as a strategic tool. AMI can – and should – be used for much more than meter reading. AMI can enhance productivity and operational excellence throughout the utility.

To justify AMI networks, utilities must move beyond simple cost-benefit analysis. They should consider high-level benefits of AMI, such as enhanced customer satisfaction and reliability. AMI computer and communications systems can augment distribution planning, asset management, outage notification, revenue forecasting/ protection and resource tracking, just to name a few.

AMI and the Balanced Scorecard can help utilities eliminate "islands of automation." By tying AMI to measures in the Balanced Scorecard or other similar tool, utilities can also derive better inter-departmental cooperation. Many utilities have dispersed systems for various applications, such as:

- Outage management
- Work order management
- GIS/Dispatch
- Business system
- Billing system
- Call center
- IVR
- SCADA

These automated processes often are not integrated, creating a situation where data is potentially duplicated or unsynchronized. But with AMI, meter data management is a critical component to enabling further value in the infrastructure. When preparing to install AMI systems, utilities must outline how that system will communicate with other legacy systems before beginning deployment. Establishing a proper system architecture that defines the linkages to outage management and other systems maximizes the benefits from AMI.

That is the strategy Atlanta-based Southern Co. has followed in preparing to use multiple fixed networks among its various operating subsidiaries. Southern's vision is to have an open-architecture system that would allow multiple AMR technologies to coexist, with a single interface to enterprise systems for billing, outage management, and other systems.

The integration of the networks would be done through the utility's CCNet (Customer Communications Network). This approach, according to Southern Co., provides two sets of advantages:

1. It leverages existing assets; and

2. It improves efficiency of the core business.

Specifically, the open nature of the architecture will enable relatively straightforward systems integration and rapid implementation and integration of new technologies (hardware or system software), states Southern Co. The set-up will specifically provide:

- Enterprise-wide access to data via a Web browser;Greater automation scalability;

- More targeted applications of AMR technologies; and

- Ensured maximized value of AMR applications.

In addition, both large investor-owned utilities, such as Chicago-based Exelon, and small customer-owned firms, such as Central EMC in Sanford, N.C., increasingly use AMI systems to help detect nested outages. In addition, industry vendors are developing more advanced software features to enhance the use of outage information that can be derived from AMI networks.

When a utility restores a large outage, it may not be aware of other internal outages nested within the larger outage. While a field crew may have restored service by removing a tree limb from a power line, some customers in that area may have an additional or localized problem that requires further repair.

AMI can help detect those outages by "pinging" or calling all meters to validate service restoration – before the crew leaves the site. This provides a number of benefits:

1. Decreases field crew costs – eliminating re-visits to nested outages increases efficiency of the work crew and decreases the cost of repairing outages.

2. Increases customer satisfaction – turning on the lights faster increases customers' perception of their utilities. Customers, by and large, understand that storms will cause outages, but they expect power restoration to be as quick as possible and the utility to know when their lights will come back on.

3. Decreases customer service costs – identifying and restoring power to those with nested outages can reduce customer calls to the utility.

4. Minimizes revenue loss – as customers are restored more quickly, the consumption of energy resumes more efficiently

Utilities looking more seriously into remote disconnect/reconnect

Remote disconnect/reconnect, on the other hand, is a specific application that utilities can employ to enhance the business case for AMI. Using this feature of some AMI systems enables utilities to remotely turn-off the flow of energy to customers, thus eliminating the need to send a technician to the premise. This can quickly provide a positive return-on-investment. By remotely turning a customer's electric service on or off, utilities avoid at least one visit from a field service representative, and often two or more. Utilities estimate it costs between $20 to $50 to send a field representative to a customer location outside the regular meter reading date.

Off-cycle reads are particularly frequent for transient locales such as apartment locations, especially those in college-based towns, or customers who regularly pay late. In college housing, for example, utilities have a high rate of turn-ons/offs because students often move in and out at the beginning and end of each semester.

Remote disconnect/reconnect capabilities can also be helpful for more efficiently dealing with delinquent customers. When a utility disconnects service to a delinquent customer, that customer often pays the bill immediately after power is cut. This necessitates a second trip for the utility to restore power, creating a total cost of $40 to $100. Remote disconnect eliminates those costs. Some case studies have shown that customers – knowing the utility can turn them off instantaneously – are more likely to pay their bills quicker, which enables the utility to reduce its bad debt while increasing cash flow.

SRP eliminates 14,000 field orders with remote disconnect

Since May 2005, SRP has used remote disconnect functionality to work more than 14,000 field orders without leaving the office. Performed in conjunction with the utility's wireless fixed network, these orders were worked in a timely manner and not subject to labor availability, weather conditions, or other factors that can delay the completion of orders. SRP is now set to install disconnect switches on at least 25,000 more meters in apartment complexes in and around the Phoenix area.

On/off disconnect capability is increasingly important for several reasons. First, many of the pioneering AMR projects have enabled many utilities to realize many of the low-cost benefits of AMR – i.e., labor and operational cost savings. These utilities are now targeting higher-level benefits to further leverage their AMR/AMI assets. With this added ability, utility management can utilize personnel to perform other higher priority work, while minimizing the risk of lost revenue due to unauthorized electric system usage.

Higher-level benefits are particularly important for utilities looking to upgrade from mobile systems to fixed networks. These utilities often have already used drive-by systems to lower costs and increase accuracy of meter reading, and now require more enterprise-wide benefits to justify AMI fixed network investments.

Meter manufacturers working to integrate remote connect/disconnect

Many meter manufacturers have developed or are working to develop less expensive remote disconnect components placed under the cover of residential meters. The "under the cover" capability is vital. Until recently, most vendors offered only remote connect/disconnect collars that are typically installed behind the meter.

Collars pose two problems: cost and the potential for tampering. Collars generally cost about $200 to $250. At that price, few utilities can justify them for more than a small percentage of high cost-to-serve customers. Metering employees are also leery of collars because their physical presence outside of meters can make them tempting targets for tampering.

Vendors are progressing in developing remote disconnect products. A few meter vendors already offer remote disconnect under the glass and many others are expected to have this feature sometime during the next year. And most are working to provide this functionality at a reasonable increase to existing product costs.

Remote disconnect capabilities are also likely to receive a fair amount of regulatory scrutiny in how they are applied by the utility. One concern with remote disconnect is the potential danger at the time of restoration. For example, what happens if a situation occurs where a combustible object is lying on the stove and the stove is left in the "on" position, setting up the potential for a fire.

There are several ways to combat this danger. First, meters can be equipped with a reset switch or button that does not restore power until a customer presses it. Another option is, as a matter of policy, to require customers to be at home when power is restored.

Remote disconnect/reconnect and the Balanced Scorecard provide utilities two more useful tools for enhancing the value of their planned AMI investment, particularly in the absence of any regulatory "push" for implementing the technology. Continued use, and sharing of, these types of tools will help utilities increase their potential justification of AMI, thus providing more ways to improve their utility's performance. ■

About the Author

Garrett Johnston is a Consultant in the Operational Excellence group of KEMA Inc. and serves as a key member of the group's Strategic Metering unit. Garrett Johnston has 8 years of experience in providing energy insights and intelligence to large investor-owned utilities. Mr. Johnston has authored more than 30 reports on advanced metering. During his career, he has served more than 100 utilities, providing in-depth perspectives on a wide variety of topics, including broadband over power lines (BPL), reliability/outage management and billing. Mr. Johnston has a B.S. degree from James Madison University in Harrisonburg, Va. and is pursuing an MBA from Georgia State University in Atlanta (expected graduate Dec. 2006).

The Customer System Dilemma

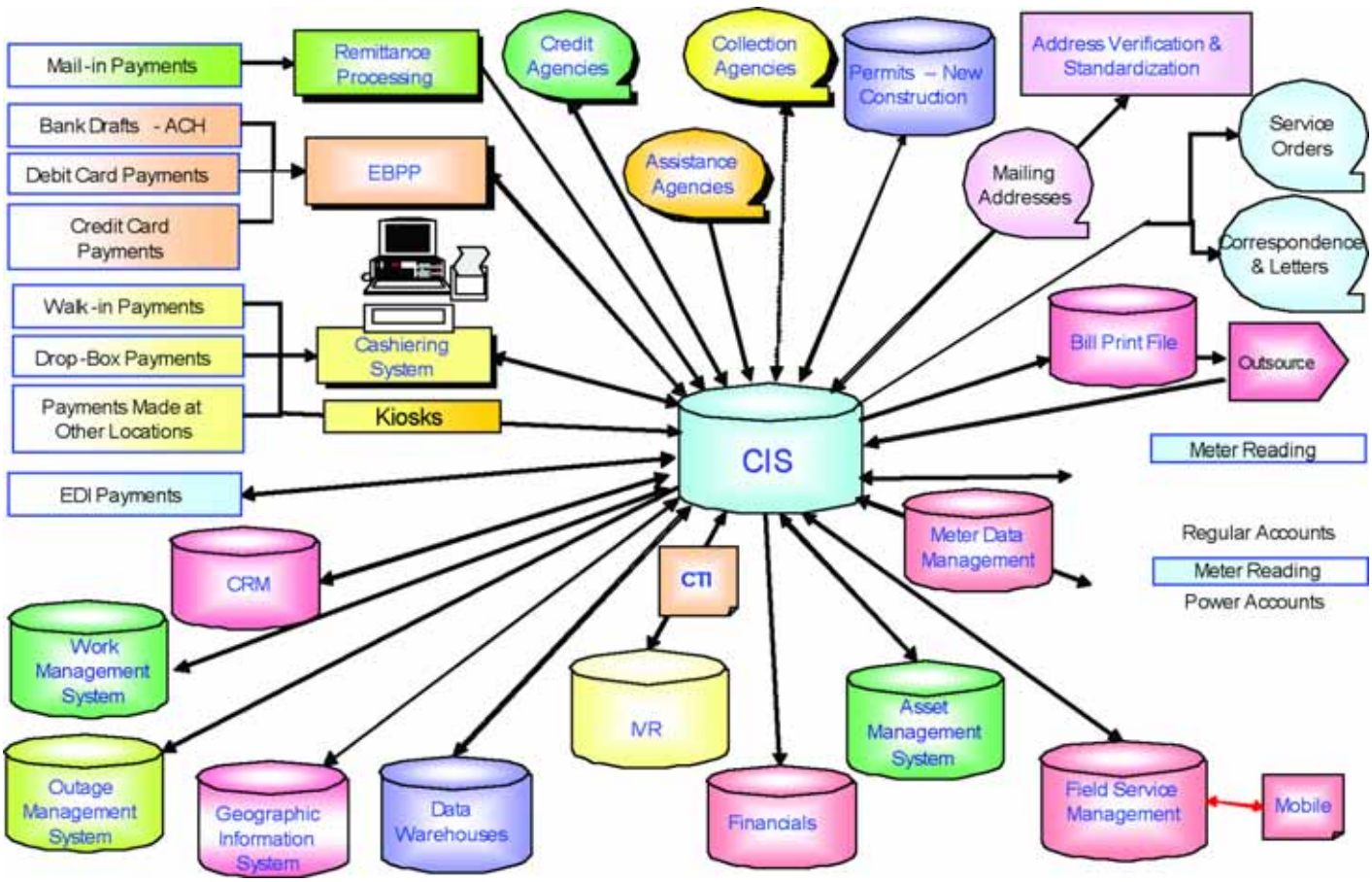
By: Gary Weseloh, Vice President and Senior Consultant with TMG Consulting, Inc.

A former colleague of mine had a habit of sitting at his desk muttering *"what to do, what to do, what to do."* I believe that if he were still working with customer systems at a utility or municipality today, he might still be muttering those words. It is the essence of what we are hearing a lot of today as utilities and municipalities attempt to get a handle on what they must to do to remain effective, efficient organizations in today's uncertain and very challenging environment.

The uncertainties that are now confronting utilities and municipalities are ever-present. Utilities are merging. Municipalities are selling off or out-sourcing all or portions of their utility operations. Both are striving to be more efficient and effective. While deregulation and competition has always been somewhat of an unknown, now many utilities are not even sure if they are ever going to have to compete in a deregulated environment and those that are in that environment cannot be sure if that will continue. And, because of all of this, future growth is very often uncertain. But, one sure thing continues to exist and is a prominent driver forcing changes in all the utility environments today. That one certainty is increased customer demand for superior service.

The fundamental system for serving customers at all utilities is the customer information system (CIS). This may be a single system, or it may consist of several applications such as a billing system, a customer relationship management system, and perhaps a stand-alone meter inventory system. But, in any case, it is the heart of the utility. The following diagram shows a fairly typical relationship between a CIS and other utility systems.

This illustration depicts the centrality of a CIS to other utility systems. It also highlights that while your CIS may be your primary focus for meeting your customer's demands, it could be other related systems that must be improved or replaced in order to provide superior customer service. In fact, in those organizations where there



are many systems linked, interfaced or otherwise integrated together, there is more of a likelihood that a dilemma exists.

The best way to address the *"what to do, what to do"* dilemma of your customer system(s) is to put together a comprehensive Application Plan. This includes a detailed, inclusive analysis of the current environment, an assessment of the current system(s), and a review of the target environment or where the utility wants to be and meticulous assessments of the alternatives that could drive the utility to that goal. The results from the many assessments will reveal the most advantageous alternative and allow the utility to prepare a business case as a blueprint for success. The following diagram depicts a high level view of this methodology.

Once the target environment is defined and the gaps are understood, the next step of the Application Planning process is to arrive at, define and document a list of all of the possible alternatives that should be considered.

The alternatives should cover all aspects of the customer solution matrix shown here, including maintaining the existing system, enhancing the existing system, migrating the existing system or replacing the existing system. Each of these major categories has one or more alternatives.

Maintaining the existing system is pretty straight forward. The option always remains to do nothing. And, the costs and benefits of maintaining the status quo are always a good baseline to use as a starting point to evaluate all of the other alternatives. This requires a complete understanding of the existing system and, what is many times more difficult to obtain, knowledge of what it currently is costing the utility to own and operate the current system. In addition, many times the evaluation around maintaining the existing system usually uncovers some actions that have to be undertaken to really make it a feasible solution. In other words, maintaining the status quo may include some improvements or enhancements to the existing system to make the possibility of keeping it a feasible option.

Enhancing the current system includes alternatives associated with making major improvements to the system itself, to the environment, and possibly adding new components. Alternatives in the "enhancing" area include a project for extensive upgrades to the existing system, re-fronting the system with a graphical or browser user interface or perhaps

developing a common front-end to bring multiple systems into a single user interface, or adding a data warehouse to allow for new access paths from the desktop to the customer data. This could include a data warehouse, a data mart, and web-based system access.

There are two alternatives associated with migrating the current system. The first is to re-host the system, or migrate the functionality from the existing system and environment to a new computing environment. The second is to re-engineer the system using the existing system as the functional baseline for the new system.

The last grouping of alternatives fall into the replace the current system category. There can be many variations of what is meant by a replacement system, but typically the choices include doing custom development, obtaining a product solution and the considerations associated with hosting, co-sourcing or out-sourcing. Custom developing a replacement system usually means an in-house project to plan, design and implement a system which would be customized to the needs of the utility. Replacing the current system with a product solution on the other hand, entails the selection and implementation of a commercial off-the-shelf solution and having the vendor make enhancements or modifications where necessary but hopefully only make configuration changes. And, there are alternatives associated with whether or not the system should be located in and operated by the utility, whether it should be hosted by the vendor or another third-party, co-sourced with another entity or if the utility should out-source the entire system.

The most difficult aspect of the Application Planning process is then assessing each of the alternatives in terms of 1) installation costs 2) operational costs 3) installation timeframe 4) solution risk and viability 5) resource utilization 6) business strategic fit 7) technology direction fit 8) benefits and improvement 9) ROI and 10) buy-in and support.

Installation Costs should include both vendor and utility costs. These may be capital or expense costs and includes costs for new hardware, software, database management systems, desktops, LANs, WANs and other environmental costs. The costs should include all conversion and installation services and vendor expenses. In addition, all other installation costs such as other outside contractors or consultants, facility costs, supplies, new PCs if needed, printers, copiers, costs for newsletters, the utility team's fully-loaded labor costs and costs for team training and possible travel should be included. And, the costs associated with the backfilling the normal work positions of dedicated team members should be included.

Operational Costs are the ongoing operating and maintenance for each alternative. This can be viewed in terms of cost per customer per month or in straight dollar amounts. Operational costs include new or reallocated labor that is associated with each alternative, costs of annual hardware and software maintenance, depreciation or other IT allocations. Monthly or "per click" operational charges from the vendor or third-party for the hosted, co-sourced and out-sourced alternatives should also be included.

Installation Timeframe is a key factor as well. Obviously, how long it will take to get each of the alternatives installed, operational and providing benefits back to the utility is important. Exactly how important this is will depend on the specific circumstances within the utility. There can be huge costs associated with lost opportunities.

Likewise, if there are issues around unsupported applications or platforms, disaster recovery and redundancy, long time frames associated with implementing a cure may be unacceptable.

Each alternative must be evaluated from the aspect of Overall Risk and Viability. Some alternatives may have manageable or acceptable risk while others may have such extreme risk that the alternative is no longer practical. And, there may be other factors that would make an alternative more or less viable than another alternative.

Alternatives should also be compared and ranked in terms of Resource Utilization. This, too, can vary widely from one utility to another depending on the utility's staffing level and its ability to take on different sized projects. Some of the alternative projects may be easy to staff with qualified resources, while other alternatives may be more difficult but the staffing can be resolved, and others simply cannot be staffed properly by utility at all.

Each alternative must also be assessed in terms of its Business Strategic Fit. Obviously, to do this the business strategy must first be defined and agreed on by the business organization and upper management. Customer service plans and goals, marketing campaigns and strategies, and operational strategies must be considered as each alternative is assessed in terms of its fit with the overall strategy.

Likewise, each alternative must be assessed in terms of its Technology Direction Fit. Where is the utility in terms of its technology curve, and how does each of the alternatives fall within that curve? This includes hardware, software, operating systems, and most importantly, integration to all of the systems, both now and in the future.

The Benefits and Improvements that will result from each of the alternatives should also be defined and each alternative assessed in order of magnitude by what they will bring to the organization - how well each will fill the gaps and bring the utility to the desired target environment. This assessment brings those sometimes intangible benefits to light and provides a way to compare them from one alternative to the other.

A Return on Investment (ROI) analysis can also be performed on each of the alternatives. This assessment pulls in the costs used in the above assessments, and then looks at the tangible benefits that will be achieved from each alternative. These tangible benefits could include actual cost savings, labor, equipment and supplies. Benefits may include time saving efficiencies, resource savings, cost avoidance, deferred costs and increased revenue from new opportunities.

The final assessment category is Buy-in and Support. This assessment includes the probability that each group, from internal user, to management, executives and even the customers, will embrace or reject the alternative. While this may have a lower weight than some of the other categories, we have all seen cases where one or more key groups have not accepted a situation, making it unworkable or unbearable.

When each of the alternatives has been assessed against these ten categories, a matrix can be prepared which can help lead the utility to the optimum solution. Then, a comprehensive business case and plan can be built around that most favorable solution. This then becomes the foundation upon which the utility can begin to develop a strategy to solve its business system dilemma. However, there may be further conditions or complications that prevent the utility from going with the highest ranked solution. Once those have been determined, it is easy to go to the highest ranked unrestricted alternative and build the business case.

This methodology works, and it works well. But it requires extensive analysis, broad industry knowledge including utility best practices and emerging technology, and an objective approach to development of an appropriate Application Plan for your utility. The results of the application planning effort will provide a foundation for a successful plan or strategy to answer the *"what to do, what to do"* customer system dilemma. ■

About the Author

Gary Weseloh is Vice President and Senior Consultant with TMG Consulting, Inc. He has over 30 years of utility experience, including the management of customer systems (CIS, meter reading, remittance processing, complex billing) at a large combination utility, consulting on mobile computing/mobile workforce management automation, and extensive application planning, system assessment, product selection and evaluation, and installation oversight projects with TMG Consulting.
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A Fresh Approach to AMR Networking

By: Russ Herring – VP, Product Development, Datamatic, Ltd.

As the costs of fixed network AMR approach the costs of traditional mobile AMR solutions, utilities are beginning to pay more attention to fixed network AMR options. Advances in network design and technology are transforming the landscape and opening up options not previously available.

The two most common radio fixed network designs are the "star" and the "mesh".

Good: Star Networks

Most current fixed network AMR options could be categorized as "star" networks. In a star network, each meter communicates directly with a central hub. The hub uses a radio system, usually mounted on a light pole or tower since it must be in range of every meter. Star networks often require FCC-licensed frequencies operating at high transmission power to cover the long distances standing between the meter and the hub. Careful network planning and hub positioning are critical as it must address all current and potential sources of interference and obstruction. If any meter cannot "see" the hub in question, another hub must be added. Another issue for star networks is that unforeseen obstacles easily impair network performance. For example, an RV that is parked between a meter and the hub might interrupt communications as long as it is present.

Better: "Mesh" Networks

Mesh architectures consist of a network of meters each having the ability to transmit its own information as well as receive and relay information from neighboring meters. To join a mesh network, a meter need only "see" any neighboring meter. A mesh controller serves to collect information from a large number of meters, referred to as a "cluster". Controllers are inexpensive and are typically mounted on utility poles. Unlike star networks, mesh network controllers only need to see one meter anywhere in the cluster for the network to operate. A key feature of a mesh network is the many different communication paths between any meter and the mesh controller. In the case of one or multiple failures, the mesh will automatically route around the failed segment. Thus mesh networks are inherently self-healing.

Mesh networks are also self-configuring. New meters automatically register themselves into the network without user intervention. In fact, adding meters to the mesh actually increases the number of paths for communication. This makes the mesh structure ever more robust and fault-tolerant.

However, not all mesh networks are created equal. While self-healing and self-configuring characteristics are common to most mesh networks, suitability for utilities will vary widely based on design specifics and a network's intended application. Achieving reliable communications over long distances at moderate data rates in a large network is paramount and is what best distinguishes AMR networks from more common, standards-based offerings like Zigbee, WiFi, or Bluetooth. While these can be adapted for AMR applications, they are better suited for smaller, shorter range, higher data rate applications.

Best: AMR Mesh Networks

AMR mesh networks are designed from the ground up for the unique requirements of automatic meter reading.

A strong AMR mesh network is fully ad-hoc. This means that no particular arrangement of nodes or rigid deployment plan is needed to set up the network. While an AMR mesh has all of the inherent advantages of an ad-hoc network, its innovative architecture eliminates the complication and computational problems associated with routing tables. This is a major advantage as it lowers costs and keeps the network free from losses in communications associated with conflicts, jamming, and/or node failures.

Discovery of new meters within an AMR mesh is completely automatic. Data transmission, reliability, throughput, and other performance parameters are unaffected by the number of "hops" or 'hopping distance" between the controller and its furthest node. An AMR mesh network is highly scaleable - out to literally millions of endpoints.

A well-designed AMR mesh incorporates error-checking and correcting protocols to ensure high data integrity and maximum range. And due to the fact that most nodes will have multiple paths for the data, there should be an extremely low probability of missing data.

The use of Frequency Hopping Spread Spectrum (FHSS) techniques also maximizes range and reliability. Other spreading techniques such as DSSS are ideal for short-range radio links requiring continuous connection such as a cordless telephone or WiFi computer network, however for packet-based AMR networks, FHSS provides significantly improved range. Operating in the 900MHz unlicensed band also offers greater range than solutions operating at higher frequencies while eliminating the difficulty and expense of purchasing spectrum licenses from the FCC.

While it is important to ensure that all data is moved efficiently through the network, it is equally important that the data remain totally secure, safe from unauthorized parties. The strongest readily-available security measures use

128-bit encryption. This technique, combined with a frequency-hopping, spread-spectrum radio signal and digital packet structure, provides a level of security that customers and utilities can trust with their critical billing data.

A Summary of Key Requirements for Tomorrow's AMR Mesh Networks

Range – Endpoints must have high sensitivity and power for long range and immunity to rain, foliage, and other obstacles. Look for "link budgets" of 130dB or better. Note: A link budget is an aggregation of positive and negative elements (including transmitter power, receiver sensitivity, and antenna efficiency) that indicate expected performance between any two points in a network. A budget of 130dB is enough to allow for fluctuations in the environment while still delivering consistent operation.

Scalability – A strong AMR mesh network must have the ability to add thousands, even millions, of metering points without extensive planning. The system must be able to have endpoints automatically register themselves into the network. Note: A mesh network only gets stronger and more fault-tolerant as more metering points are added. This is because more metering points mean more routing options to overcome obstacles and issues.

Unlimited "Hops" – It is imperative that an AMR network not have a hard-coded or a practical upper limit on the number of "hops" (transactions between points on the network) a meter's signal can take. Unlimited hops ensures reliability by allowing signals to go wherever they must to make it back to the the controller. This feature also reduces the planning burden as networks are expanded.

Dynamic Routing – AMR mesh networks must have the ability to immediately and dynamically adapt to an ever-changing RF environment. Factors that can influence RF propagation include position and size of vehicles in the area, new construction, seasonal foliage on trees, the ebb and flow of other RF traffic - pagers, wireless phones, baby monitors, etc.

Path Redundancy – The ability to send data over multiple simultaneous paths raises the reliability of a network. Intelligent code at the collector level discriminates between redundant and new data as it is received.

Survivability – A well-designed network should have the ability to instantly recover from meter failures / power outages and continue network communications without loss of data. This is usually done with some type of battery backup or capacitor. Because mesh networks use the individual metering points to relay information, it is important that they stay "up" and allow the mesh to continue to operate for a significant period of time even after power is lost as opposed to the older approach of sending a "last-gasp" transmission. This allows points at the edges of the network cluster time to relay their data before the network itself shuts down. Thus, network operators have status reports from all points, even in an outage situation.

Congestion-Free – AMR network topologies are dictated by the layout of the communities they serve and must be immune to bottlenecks and other sources of congestion.

Security – Data security is of paramount importance. A secure AMR mesh network requires the strongest 128-bit encryption along with spread spectrum communications.

Reliability – Data integrity throughout the network must be ensured through advanced FEC error-correcting codes, 32-bit CRC error checking and other sophisticated software algorithms.

Interoperability – In order to maximize ROI, an AMR mesh network should support collection of water and gas as well as electric meter readings. The mesh approach is ideally suited for this as gas and water meters are typically within close enough proximity to be able to "hop" onto the network either on their own or via the electric meter. And while collecting a single utility on the network will probably yield a satisfactory ROI, being able to partner with the local water and/or gas utilities only makes it look even more attractive and will hasten the network's transformation into a profit center.

Low Cost – To become mainstream, an AMR mesh network should narrow the significant cost gap that currently exists between mobile and fixed-base AMR solutions. This cost gap has historically been a barrier to utilities choosing fixed base over less expensive mobile AMR

systems. As this gap closes, it should become more common for utility ROI's to shift in favor of network AMR.

Flexibility – AMR mesh networks should support a variety of enterprise networking and software options and not force changes to billing or other systems. Support for current and emerging network communication standards helps the network fit well into more situations.

Power Management – Power management is critical for networks also carrying water and gas AMR applications. Water and gas meter interface units must operate for 10 years or more on a single battery. More frequent battery replacements will destroy otherwise attractive ROI models.

Upgradeability - Solutions must also support in-service software upgrades for future enhancements. Updates and new features should be able to be "pushed" to metering endpoints without having to visit the sites.

Migration – A well-designed solution should support migration from walk-by to drive-by to cluster to full fixed network operations.

A Clear and Logical Migration Path

An AMR-specific mesh network offers a unique migration path for utilities interested in deploying walk-by or mobile metering now and moving towards full network operations.

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Walk-by/Mobile: Endpoints in an AMR mesh network can be initially deployed and read in a walk-by or mobile mode using an inexpensive handheld computer or vehicle-based collector. At this stage, the system behaves no differently from a dedicated mobile AMR system. Although users will certainly want to continue their migration to greater levels of automation, the system could operate indefinitely using a walk-by or mobile AMR collection strategy.

Mesh clusters: This next step increases efficiency by deploying mesh controllers at the entrances to subdivisions, townhouse and gated communities, and closed communities such as military bases and airports. Mesh controllers automatically build a mesh cluster and collect the data from every meter in the cluster. A vehicle-based reader can then collect all of the data for the mesh cluster of 1000 or more meters by simply driving to the mesh controller. Collection times are greatly reduced. Again, the system could also operate indefinitely in this mode.

Full Mesh: Full fixed network is achieved by deploying a backhaul capability from the mesh controllers to the utility. AMR Mesh controllers should support multiple backhaul options including WiFi; GPRS and other cellular data options; RS-232; POTS or even a secondary mesh network. Once connected to the utility, mesh controllers provide real-time alarms and data collection capabilities directly to a dedicated AMR server. Data should be stored in an industry standard SQL database for easy reporting and interfacing to billing, customer-service, and other enterprise software systems.

Summary

Mesh networks designed specifically for AMR are emerging as more "intelligent" and cost-effective ways of approaching utility data collection than traditional star network approaches. Networks designed from the ground up to overcome AMR's most pressing challenges: transmission range limited by obstacles and interference, ease of installation, the need for high levels of redundancy and extremely low cost are poised to take a leading position in the next generation of automatic meter reading solutions. ■

About the Authors

Russell Herring is a product development expert and one of the pioneers of applied consumer wireless technology. He joined Datamatic's team in mid-2005 to oversee the engineering, development, technical research and testing of Datamatic's innovative hardware and firmware products.

Russell has approximately 30 years experience in engineering, product management and engineering management with GPS systems, voice and data communications, telematics and wireless technology. He is an acknowledged leader in the development of GPS systems and holds four key patents for wireless communications technology.
Russell also led the design team on an innovative full echo-canceling IBM ThinkPad modem and speakerphone system.

Russell is a graduate of Texas A&M University, where he earned a Bachelor of Science in Electrical Engineering. He served as an engineer at Datapoint Corporation, a San Antonio based computer systems manufacturer. Russell's expertise in engineering management was established during his tenure at Data Race, Inc. and ATX Technologies, Inc., where he excelled in budget and facility management as well as research and development.

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Taking AMR/AMI to New Heights

By: Marc Reed, VP Software & Systems, AMDS
& David C. Duclos, SVP IT & Engineering, USA Mobility

Prologue

More than two decades ago when automated meter reading (AMR) was still in its infancy, many believed this new technology would take the industry by storm and that in a matter of just a few years, AMR would replace meter readers on a grand scale. However, as we now know, that did not happen. Part of the reason it didn't happen is that simply replacing meter readers doesn't usually provide ample justification for automating the meter reading process. Moreover, the huge installed base of electro-mechanical meters would prove much harder to displace than most initially thought would be the case, based on early indications.

The other part of the reason that AMR didn't take off as quickly as expected was that those millions of traditional meters – though limited in their ability to provide much of anything but a meter readout that could be read and recorded easily by a human meter reader – were relatively cheap (well under $50); quick and easy to install; rugged, and extremely reliable over long periods of use.

Finally, there came the realization that utility service territories often demand flexible and sometimes varied methods for reading meters. Hard-to-read meters have a different set of meter reading metrics than meters that are easily accessible and have no pervasive impediments to "first-time read" accuracy and availability. Likewise, commercial and industrial (C&I) meters have different metrics than their residential counterparts.

This realization that all meters are not created equal gave rise to widespread re-evaluations of AMR principles from both user and supplier perspectives. These and other factors eventually ushered in the development of multi-faceted AMR systems employing multiple types of AMR techniques and technologies and embracing a more holistic view of the meter reading challenge.

Wireless Comes of Age

So began the wireless communications era. Almost immediately, unlicensed spread spectrum radio was widely touted as the technology that would finally free utilities from wires and meter readers altogether. However, a spate of new problems including range limitations, spectrum interference and reliability issues compounded by a utility workforce still firmly rooted in the business-as-usual mindset of electromechanical metering kept the wireless revolution at bay for the better part of yet another decade.

Still in search of the ideal one-size-fits-all solution, utilities remained nearly as determined to find their ideal meter reading solution as they were determined to try out every nuance that came along (generally in the form of pilot projects) in hopes that the next trial system would be that solution. But utility managers kept seeing more pitfalls – and more latent costs – looming.

Indeed, it was financial concerns about future operational and support costs – not necessarily technical issues – that kept utilities from buying into any singular technology or supplier on a significant scale; that is, anything more than a few thousand units and usually far fewer than that. Needless to say, this was not the tune that suppliers wanted to hear, but it was being played at utilities of all types and sizes, over and over again. These major impediments to rapid market expansion forced AMR companies to go back to their drawing boards to find ways that these devices could provide a more attractive business case and be built, installed and maintained at a lower overall cost.

Meanwhile, further study of the meter-to-cash process soon showed that inherent cash flow delays associated with the manual meter reading process – not the cost of the meter readers themselves – were actually a far more costly component. It eventually became apparent that advanced AMR networks would provide the best solution to this cash flow delay, allowing utilities to bill using meter readings taken the same day, rather than having to wait anywhere from 30 to 90 or more days from the initial read to payment receipt.

A New Approach...

Clearly, creating an AMR network architecture that would be as attractive and economical for trial, limited scope installations as for 20- or 30-year deployments would require a completely new approach. And, in order to pass financial muster, something truly different would be needed; technology alone would not be enough. To achieve such lofty objectives, the system would have to deliver superior performance, dramatically lower infrastructure costs, minimized maintenance overhead and reduced long-term deployment risks.

At this juncture, many AMR experts point to the use of a fixed based network, the widely perceived "Holy Grail" of AMR technology, to meet the wants, needs and expectations of utilities with wide-ranging service territories and operating characteristics. Given a choice, many if not most utilities would prefer fixed based networks over drive-by systems because of the timely availability of meter data, rather than only when a drive-by truck is driven past the meter. However, fixed based networks have historically had difficulty competing with the inherently lower cost drive-by systems, primarily due to high infrastructure costs and associated support implications.

Until now, utilities have not had a viable fixed based network approach that could satisfy their business cases because of both the initial and the life cycle costs inherent to fixed based networks. That is, fixed based AMR networks have typically needed hundreds (sometimes thousands) of cellular pole-top, or meter-based data concentrators, collectors or repeaters to achieve adequate coverage in a large metropolitan area to reach all or even most of the meters. In addition, mountainous terrains and densely built

metro areas further compound connectivity problems and the associated equipment needed to mitigate those problems is usually quite expensive and hard to install and maintain.

Range, Range, Range...

This high infrastructure cost for fixed based networks really has one primary root cause: Range. Radio engineers will tell you (to borrow from the parallel analogy in the real estate market) there are three important things to consider in an economically viable large-footprint RF network: Range, range, and range.

The final step in successfully solving the range problem involves covering large metropolitan and suburban areas with a substantially reduced number of two-way Tower Gateway Base-stations (TGBs), designed specifically to minimize infrastructure while maximizing range and signal reliability.

AMDS Connect™ is a patented, FCC-licensed protected spectrum AMR network solution from Advanced Metering Data Systems, which allows the city and surrounding suburban areas of Birmingham, Alabama to be completely covered with only three TGBs; New Orleans, Louisiana with only two (even before Hurricane Katrina reduced the city's footprint by more than 60% in September of 2005) with a system that regularly delivers two-way communications ranges of over 15 miles from tower to meters.

This long-range solution was designed by focusing on five key range criteria:

- Use the tallest existing radio towers and efficient high-gain antennas;
- Acquire clear nationwide primary use licensed radio spectrum with a low noise floor;
- Design high power endpoints (2 Watts) with state-of-the-art, all digital modulation techniques;
- Design highly sensitive (-120 dBm to -130 dBm) all DSP based receiver base stations; and,
- Develop meter-to-meter "Buddy" relay mode for hard to reach meters (e.g., those in basements, behind line-of-sight barriers, etc.).

To satisfy the requirement for tall, existing radio towers, AMDS turned to USA Mobility, a nationwide provider of 2-way data messaging services. The TGB is designed to plug right into existing USA Mobility site equipment, with installations often taking less than four hours. When a TGB is installed in a USA Mobility base station equipment bay, it is able to share the power supply, existing transmitter and receiver antennas and a VSAT (very small aperture terminal) satellite-based data backhaul connection to the network operations center. And, with this VSAT connection, the use of outage-prone telephone lines for back hauling meter data to the central server can be minimized or eliminated.

A key to high quality performance from city to city required the acquisition of Federal Communications Commission primary use radio spectrum for the best and most reliable network operation. To that end, both nationwide and localized licenses were obtained. This spectrum is 100% primary use; that is, the FCC-licensed network has primary rights to the spectrum, with no other entities allowed to use the channel without permission from the licensee and with interference regulated by the FCC.

Another advantage to the licensed frequency band is that the limits for total RF output power are higher than that for systems using the license-free ISM band, typically between 100 mW and 1W. Power translates directly into range in a radio system. One tower is able to cover tens of thousands of meters. Among other advantages, this means that costs can be amortized over many more devices than is typical for conventional fixed based networks.

The system also uses the latest DSP (digital signal processor) technology in the base stations to make its receiver extremely sensitive; up to -130dBm. In fact, the design of receiver is so sensitive that it can "hear" even the weakest signals transmitted from the meters and approaches the limits of theoretical physics. This advanced design means that the receiver is able to capture virtually every message from the field, almost without regard to signal strength.

Depend on Buddies

The last and a key technique for increasing the range of the system is a patent-pending technique called "Buddy Mode." This unique innovation is an operating technique that allows all meters that detect a meter in a difficult installation – such as in a basement, below ground level or inside a metal enclosure – to relay data back to the tower for that meter. (**Figures 1 & 2**)

The Buddy Mode technique allows for messages to be relayed without requiring any additional airtime, and has the added benefit of being stateless and not needing any routing information such as that required by mesh-type networks. Moreover, this approach greatly simplifies meter installations and requires no knowledge of RF networks to deploy.

For example, if during installation a difficult to reach meter cannot communicate directly to a tower, then it is placed in Buddy Mode, allowing it to send messages to any nearby meter instead of directly to the tower. If any other meter in the typical 1-mile range of the difficult to reach meter can reach the tower, then data for that meter will be relayed back to the tower automatically.

Figure 1: *In this 50,000 meter deployment in Birmingham, Alabama, the target meter is behind a ridge so it can't easily communicate directly with Tower A, the closest TGB. But because of its long-range capabilities, the target meter is able to reach Tower B (12 miles away) and also communicate through nearby "buddy" meters acting as repeaters, thereby allowing it to reach Tower A as well. Because the more direct link (to Tower A) has poor throughput, the meter is placed in a mode that sends out one "buddy" message for every four direct messages.*

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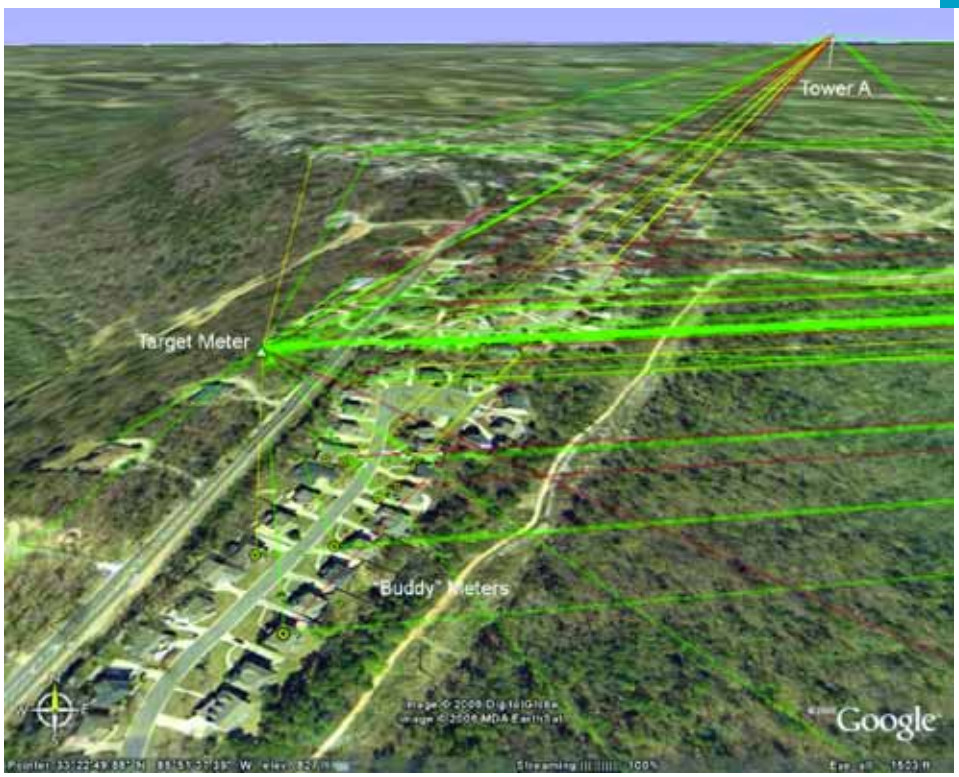

Figure 2: *The same hard-to-reach meter from a closer perspective. The advantage of tower height in improving direct line of site is clearly visible. Also, other meters in the same general vicinity that are not behind the ridge can act as "Buddies," relaying data on to the appropriate tower for the target meter.*

Existing Tower Network

USA Mobility brings an existing nationwide tower infrastructure to the network solution, including over 4,000 tower sites covering over 90% of the population in the United States. Moreover, the TGBs are designed to integrate seamlessly with existing paging equipment. This integrated solution allows the sharing of power, antennae and data back-haul channels, vastly streamlining installation time.

Teamwork

USA Mobility is also able to provide a critical service real-time TGB tower monitoring and maintenance. With its Carrier Class Network Operating Center (**Figure 3**) staffed and operating around the clock, 365 days a year, USAM can detect and report TGB problems in real-time.

Figure 3:
The USA Mobility Carrier Class 24/7 Network Operating Center and associated VSAT back-haul equipment.

Finally, a nationwide team of network technicians deployed throughout the country can respond and repair problems quickly, efficiently and economically, guaranteeing a high level of availability even under adverse conditions.

The combination of patented technology, long-range radio communications, low infrastructure cost, high reliability and tall towers provide a scalable fixed based network that can take AMR to new highs at virtually any utility anywhere in the country. ■

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Marc Reed, Vice President Software & Systems, *is a founding principal of AMDS and has over eighteen years experience in systems, software and hardware designs. Since the beginning of his career at Dallas-based defense contractor E-Systems, Reed has specialized in the design and implementation of wireless data links. Reed has won several awards for his work in the communications field and has multiple granted patents and patents pending. Reed holds Bachelor and Master of Science degrees in Electrical Engineering from Louisiana State University.*

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About the Companies

Advanced Metering Data Systems *is a metering and wireless connectivity company with its headquarters in Atlanta, Georgia and development facilities in Covington, Louisiana. AMDS provides advanced automatic meter reading, wireless connectivity and monitoring services to electric, gas and water utilities using patented technology and a dedicated, FCC-licensed fixed wireless network. For further information visit AMDS at www.amdswireless.com.*

USA Mobility, Inc.*, headquartered in Alexandria, Virginia, is a leading provider of paging products and other wireless services to the business, government and healthcare sectors. USA Mobility offers traditional one-way and advanced two-way paging via its nationwide networks covering more than 90% of the U.S. population and with roaming partners in Canada and Mexico. USA Mobility focuses on the business-to-business marketplace and supplies mobile connectivity solutions to over two-thirds of the Fortune 1000 companies. For further information visit USA Mobility at www.usamobility.com.*

The Growing Case for Mobile Asset Management

By: Hart A Levy – Director of EAM Product Strategy, Indus International

CALLOUT:

Where once assets were assumed to be stationary, owned and contained within the organization and serviced locally, now they can be owned, operated and serviced by many constituents.

Electric utilities face an increasing barrage of challenges today. As rates increase, customer demands go up with them. And, new and increasingly complex regulations and cost pressures from a variety of stakeholders create constant pressure to continually increase operational excellence. Never before has the demand for operational excellence been greater in order to deliver reliable service at affordable rates and without breaking the bank on capital expenditures.

Meeting these increasing challenges requires electricity providers to do more than simply make step improvements in performance and efficiency. In order to survive and compete successfully, utilities must revisit and rethink many of their existing business processes. In particular, critical areas such as customer service and asset maintenance and repair require significant change, and a new breed of solutions from technology vendors to empower this change. The days of paper-based communication and manual processes are over, and a new era of automation and wireless communication has arrived.

One area where this change is especially striking is in the maintenance and repair of transmission and distribution assets. As populations grow and new businesses spring up in their service areas, electric utilities find themselves managing an ever-growing set of widely dispersed assets which are often associated with locations and customers. The growing trend of mergers and acquisitions places an added strain on utilities as they race to bring an even broader and more diverse multitude of T&D infrastructure within a common view. Major blackouts in the last few years, and the resulting regulatory changes, add yet additional focus on the effective maintenance and rapid repair of T&D assets.

Not surprisingly, electric utilities are realizing that a new breed of enterprise asset management (EAM) solutions are required to survive in this brave new world. New solutions are needed -- solutions which extend asset management and maintenance capabilities in order to help extend the life of the asset, as well as to increase the uptime and reliability of their infrastructure.

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Mobile Asset Tracking is Key to Effective Service Management

Electric utilities face a unique set of challenges in managing the wealth of physical assets within their T&D infrastructure. For instance, like many other industries, they are confronted with the growing requirement to track and maintain mobile and dispersed assets. Assets such as meters, power lines and transformers are largely dispersed across various physical locations, including customer premises. Replacement parts for these assets provide an additional element of complexity, as they must be tracked from premises to premises in the trucks of numerous field service technicians.

Utilities have a critical need to track these mobile and dispersed assets in order to:

- Comply with Sarbanes-Oxley and other industry regulations, by maintaining a complete audit trail of assets.
- Increase customer loyalty and generate new revenue streams by transforming traditional service activities into integrated profit-making operations.
- Reduce costs by outsourcing non-core activities such as equipment maintenance and making service operations improvements.
- Extend best-practice maintenance approaches to assets dispersed outside normal organizational boundaries.

However, service providers to utilities have long struggled to adopt even the traditional work-management solutions precisely because their asset base includes numerous and diverse assets, much of which are not contained within the four walls of a plant or building. Managing assets that are so widely dispersed and frequently changed out for repair creates an intensive process to ensure that assets can be tracked. This struggle has come to the forefront for many utilities, because knowing exactly where assets are located -- not to mention their status and maintenance history -- is now required by new industry regulations and policies.

In order to meet these challenges, some utilities have turned to outsourcing the maintenance of infrastructure assets. This growing practice allows utilities to quickly scale resources while simultaneously reducing overhead, without disrupting or degrading key services to customers. However, outsourcing

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brings its own set of challenges. Outsourced service organizations require tools that enable them to analyze the reliability and performance of the assets they maintain. Similar to preventive and predictive maintenance approaches offered by traditional EAM software solutions such as Indus, solutions that analyze asset performance are a critical tool for these service providers.

Some service offerings include entitlements such as service calls and replacement parts for the assets these service providers maintain. These entitlements often are tied to service level agreements (SLAs) which require that service providers ensure assets maintain a certain level of uptime and/or performance. Therefore, in order to offer these services and remain profitable, these companies must closely track failure rates and causes against the assets. The ability to track performance and reliability of dispersed assets is not only important in meeting SLAs; it helps to set realistic SLA parameters in the first place. Therefore, understanding the life expectancy and reliability of an asset is an integral part of defining service coverage for the asset.

Know Thy Constituent(s)

One you have implemented a system that allows you to track the location of mobile assets, you are only part of the way there. As assets move from location to location, there will often be different permutations of asset owners, asset operators and asset service providers. Consequently, next-generation asset-tracking systems also need to allow the definition and association of multiple constituents.

Take for example a meter. As the asset owner, the utility essentially leases or loans the meter to a customer either on a home or a place of business. The home or business who uses the power that flows through the meter becomes the asset operator. When service is needed to repair or replace the meter, the utility may use an outsourced service provider to provide the repair service, making that company the service provider. Each of these constituents -- owner, operator, and service provider -- have activities, costs, and return on investment related to the asset. And, this information must be tracked, stored, and managed distinctly for each constituent based on their individual business and security needs. For this requirement to be met efficiently, any system tracking the asset must be able to dynamically recognize the constituents based on the assets' location, type of work being performed, and other variables. The system must also be able to provide information on the asset performance, history and failure rates to assist the service provider in maximizing the life of the asset.

New Realities Require New Technology

Dealing with the new reality of multi-constituent, dispersed assets requires more than the traditional EAM approach to asset management. It requires companies to change the way they perform, measure and optimize the delivery of services — the cornerstone of customer satisfaction and incremental service revenue. And, EAM technologies must evolve in kind to support the tracking of dispersed assets and enable dynamic functionality which intelligently reflects multiple locations and owners for each asset.

Many EAM solutions already offer a mobile capability, enabling field technicians to access work orders and related information from their laptop or PDA at the point of service and providing real-time update of work status. In addition, new technologies such as automated meter reading (AMR), radio frequency identification (RFID), and global positioning systems (GPS) are also becoming widely adopted so that asset tracking becomes immediate and automated, no longer requiring field technicians to manually inventory and verify assets at each location. Both local and global positioning systems can now support movement of assets, as well as maintain a history of location and usage.

Next-generation EAM solutions must enable these advanced positioning and other mobile tracking technologies. They must also incorporate preventive and condition-based maintenance and integrate routing information, real-time inventory data and service requests. As a result, organizations will be able to track mobile and dispersed assets from one location to another, return the assets to inventory, and issue them directly to customers while also having multiple-party ownership, operation and service.

In Summary ...

In the world of electric energy T&D, most assets are not confined to within the four walls of a plant, but extend out geographically to other parts of the country and to the customers that the organization serves. As utilities progress to meet the demand for management of dispersed assets, they need new tools to manage the asset lifecycle. These organizations should seek out solutions that offer location- or customer-based asset tracking, asset location history, stationary vs. moveable equipment, preventive and predictive capabilities, local and global positioning enablement for automated tracking of asset movement, and the definition of multiple ownership and constituents. They will find that the payback on these solutions will make them well worth the investment. ■

About the Author

Hart Levy is Director of EAM Products and Strategy for Indus International. Previously, he was Director of EAM Product Management at Oracle Corporation. He holds a Bachelor of Science degree in Psychology and Business from Berry College.

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What's a Customer Worth?

Why Customer Lifetime Value Matters

By : Kay Fuhrman, Vice President – Business Development Utility Services, Alliance Data

In an August 2005 report issued by Standard & Poor's (S&P), it states there is a "fairly strong correlation" between customer satisfaction and a supportive utility regulatory environment – and possibly better credit quality. Titled "Customer Satisfaction Levels Can Affect U.S. Utility Credit Quality," S&P's internal study compared its opinion of a company's regulatory environment and the J.D. Power and Associates Customer Satisfaction Index (CSI). Simply stated, satisfied customers are an asset in achieving favorable regulatory outcomes, higher company valuations and, ultimately, higher stock prices.

Just as the tangible assets of plants, pipes and wires have value, a utility's customers possess a less tangible, but even more important, value. Handled with care, they don't depreciate. In fact, customers possess intrinsic financial value that utilities can leverage to achieve their goals in the marketplace. Tom Peters, famed author of In Search of Excellence, stated it this way: "It boils down to this. When you build a plant, it starts depreciating the day it opens. The well-served customer, on the other hand, is an appreciating asset."

The electric utility landscape is experiencing a sea of change – just where the waves will ultimately carry the industry is still an unknown. Regardless, most utilities realize that 21st century customers are a force to be reckoned with and an asset to be leveraged. These empowered, enlightened consumers demand more from their utility every year. The key is delivering service aligned with expectations in a cost-effective manner. But how much is it worth to the utility to give a customer the best possible service and maximize the value of the relationship?

Customer Lifetime Value – A Fundamental Concept

Faced with this dilemma, utilities are discovering what many other industries have understood for years – the concept of customer lifetime value (CLV). According to E Source, a

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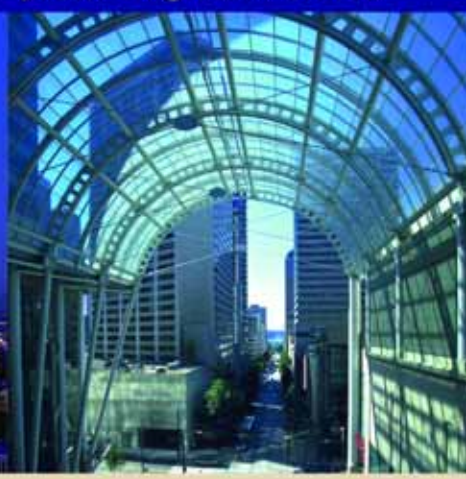

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division of Platt's, an energy information and services provider, "Growing recognition of the lifetime value of a customer relationship is raising the profile of customer care in the utility industry from an operations backwater to a key strategic asset."

While there are many variations on the definition, marketers tend to think of CLV as a metric that projects the total value of a customer over the entire history of that customer's relationship with a company. According to COLLOQUY, the loyalty-marketing publication, CLV is, at its root, a measure of the retention effect of a company's marketing efforts. In other words, if a company has a good understanding of a customer's current or potential value, and they exercise a marketing stimulus that keeps that customer from attriting, then the retention effect compounds over time-- the company not only retains the customer's spend during this period, but all future periods over the history of that customer's relationship. This compounding effect allows companies to understand the Net Present Value (NPV) of their marketing efforts. Inputs that typically allow them to calculate CLV are acquisition costs, churn rates, discount rates and retention costs. For yearly sales cycles, CLV scores are typically calculated three to seven years in the future; calculations any farther into the future are usually too speculative to be useful.

Beyond the Numbers: CLV as a Way of Doing Business

However, CLV is more than a numbers game. It requires a new perspective on the way business is conducted.

UtiliPoint® International, Inc., a leading utility industry analyst firm, in a white paper titled "The Changing Nature of Customer Service", stated, "Utilities must match their service level to the needs, preferences, priorities – and lifetime value – of the customer they are serving." Further, according to UtiliPoint, "Effective customer service not only involves strengthening existing bonds, but it also means increasing business opportunities. The key to improving customer service is optimizing the customer experience to build loyal relationships. Customer loyalty is essential to profitability, growth, and competitive differentiation." For some utilities, this approach will require a major shift in perception, culture and approach. No longer are customers merely ratepayers or accounts – they are individuals who can increase the value of the utility merely by their positive opinion and perception of the company.

As noted by Standard & Poor's report, J.D. Power examines five factors to measure customer satisfaction:

- Power quality and reliability
- Company image
- Price and value
- Billing and payment
- Customer service.

Taken together, these factors, if positively perceived by the customer, add value to the utility. As S&P states, "Although the trend toward competitive markets has stalled, of course, and even backtracked in some states, customer satisfaction still influences credit quality. Standard & Poor's believes happy customers may translate into a happier regulatory environment, and regulation is a highly important factor in ratings decisions."

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We Are Not Alone: What Other Industries Already Know

Utility colleagues in the wireless telecom industry are keenly aware of the critical value of customer retention and loyalty. A report from Peppers & Rogers Group, entitled "What Every Exec Should Know About Customer Retention," states that this is an industry in which "it can easily cost more than $300 to acquire a new retail customer, and perhaps $60,000 or more to secure a new enterprise customer." While customer acquisition and retention are just two variables in determining customer value, they are particularly essential in the mobile telecom world. Peppers & Rogers cite a marketing campaign by the wireless division of Sprint that increased its wireless customer base by 22 percent and a single-quarter operating income improvement of 64 percent. However, Sprint's campaign also created more shareholder value as a result of a significant decline in its customer churn rate, hence, greater lifetime customer value. These acquisitions and retentions each created about the same amount of increased lifetime values.

This outcome is supported by research reported in "Valuing Customers," published by the Marketing Science Institute, which stated, "…Retention has a very large impact on customer value. Specifically, a 10 percent improvement in retention increases the value of a firm's customer base by about 30 percent."

Who's Minding the Shareholders?

In a Sarbanes-Oxley, post-Enron world, the feet of corporate executives are routinely held to the fire when it comes to explaining the financial profile of an organization. Investors expect specific customer data, such as how much you are investing in each customer, earnings realized per customer, customer satisfaction levels, and how the organization is maximizing opportunities to increase customer value. While many utilities still have a captive audience, how management spends money to service customers – and the value delivered for that money – factor into market valuation and perception. Investing in the lifetime value of customers can demonstrate that the utility is prudent, customer-centric, regulator-sensitive and accountable to its shareholders. Claes Fornell is a pioneer of the American Customer Satisfaction Index and expert on customer asset management. His advice: "Unless an action is likely to increase both capital efficiency and the value of customer assets, don't do it."

Customer Satisfaction and Customer Lifetime Value: The Convergence

Faced with the impetus to incorporate customer lifetime value into decision-making, how does a utility translate that concept to the daily delivery of customer service and achieving customer satisfaction?

The process could start by gaining a greater understanding of the customer base, segmenting customers by available demographics, credit and payment history, usage patterns and potential for increased sales via upselling and cross-selling. Management can then make assessments of how best to serve the customers – while still adhering to regulatory guidelines – that create the most value. For example, the most valuable customers could receive premium service when they call. Customers with poor credit histories may not receive the fastest service. The utility could survey the high-value customers or those likely to increase value to obtain feedback on service delivery and how the utility might serve them better. In competitive markets, acquiring and retaining the right customers and building their lifetime value is key to survival.

The utility should also have in place a mature emergency and disaster response plan. Nothing dooms customer satisfaction faster than the perception that the utility is either unprepared or unresponsive during an emergency. A good faith effort will earn customer satisfaction, even if service cannot be restored as quickly as customers wish.

Utilities who demonstrate their ability to manage responsibly and without waste may be able to count on less customer resistance and a more positive regulatory environment. In addition, they will be more appealing to capital markets and, as S&P notes, earn better credit quality as a result of higher customer satisfaction. The ability to demonstrate increased valuation and higher credit quality is critical in obtaining favorable financing and decreasing indebtedness. Equally important, shareholders – and stakeholders in municipal environments – will see their investment appreciate as a result of customers who believe the utility sincerely cares about identifying and meeting their needs. ■

About the Author

Kay Fuhrman is Vice President of Business Development for Alliance Data's Utility Services division, supporting sales and business development activities for the company. Kay brings nearly 20 years of utility and energy experience that includes leading large-scale sales negotiations with tier-one utility clients. She can be reached by phone at 972-348-4396 or via email at kfuhrman@alldata.net.

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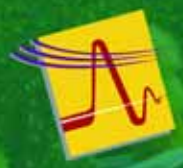

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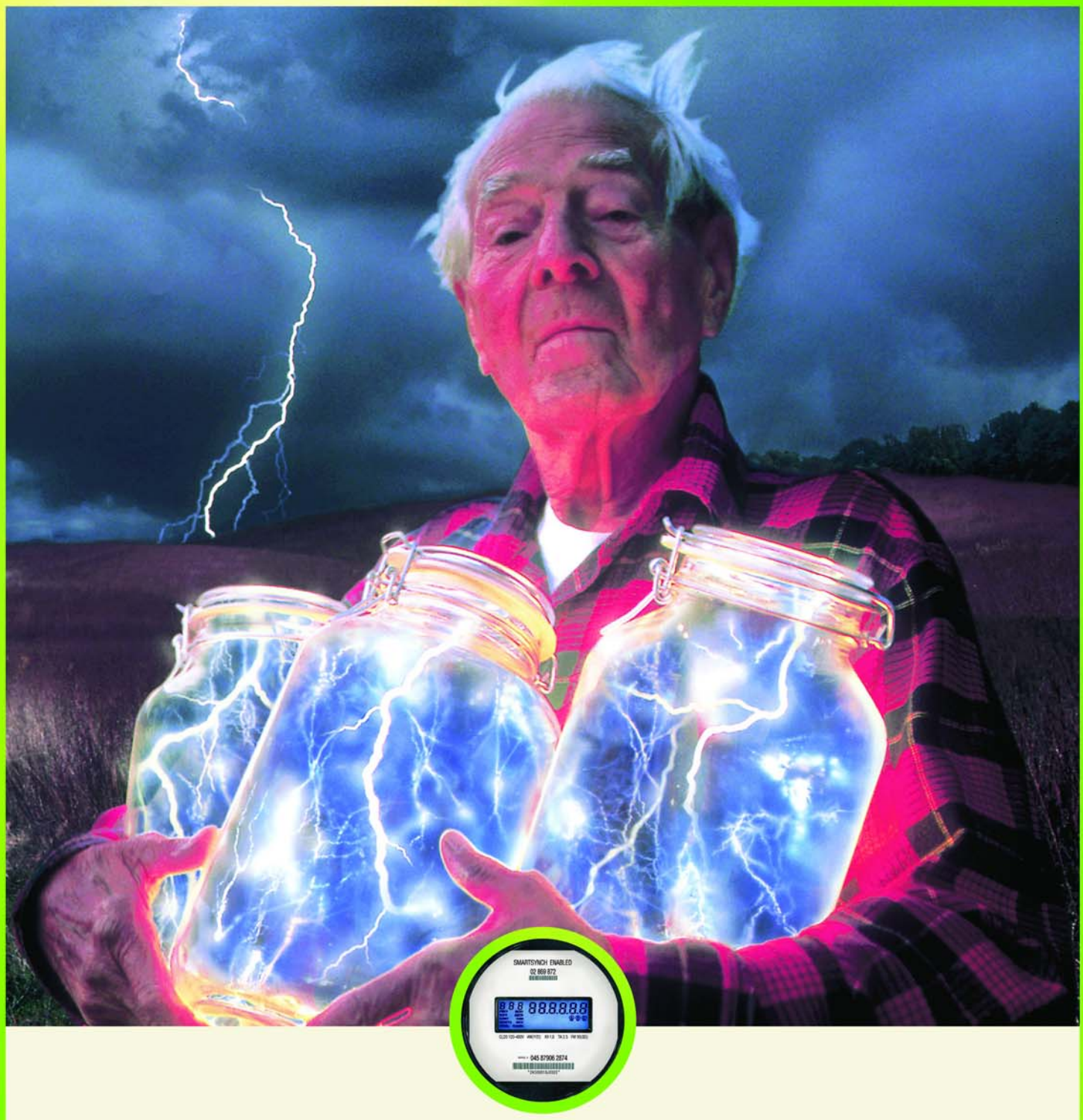

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