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Utilities and water agencies continue to adopt automatic meter reading (AMR)/Advanced Metering Infrastructure (AMI) at a record pace. Could it be called a stampede? Not yet, but nonetheless, we see city after city announcing another energy-saving, labor-saving, water-saving AMR/AMI project. Smart metering makes it possible, but it’s a foregone conclusion that, no matter the meter, accuracy of the data is no longer the question. Now utilities are asking about wringing the maximum value from the data. And most certainly there are many choices, as well as benefits.

Take the recent example of City of Ann Arbor, MI, cited by Forbes Magazine as a top college sports town and most livable city (home to five colleges and universities, including the University of Michigan), and yet, with a population of 114,000 concentrated in just 27.7 square miles, one wouldn’t call this livable city a victim of urban sprawl. But it was a victim of an obsolete technology—the city’s drive-by meter reading program—a worn out system that struggled to cover 75% of the meters. Of those, an average of 1,200 required re-reads, and the city averaged 900 billing adjustments annually. Customer complaints were constant, but single quarterly meter reading crippled the utility’s ability to resolve problems.

Adding interest to insult
“We were sending our meter staff out to do follow-up meter reads, and it was a huge waste of effort and administration,” explains Wendy Welser, customer service manager, City of Ann Arbor. “When we did discover an error, we were back to billing the customer, which is also a problem, or we were refunding the customer; and that didn’t feel good to them because we were doing it based on an estimated read, which is what we had to do until we had an actual read. Sometimes we owed them hundreds of dollars.
and, in extreme cases, thousands of dollars. And of course, they were demanding interest.”

The average annual cost associated with meter-reading issues (not including high bill complaints and technology failure) could have earned some decent interest—it was $300,798. While that’s not a huge expense in terms of total operations costs, it’s still significant. As Welser explains, “Anytime you can save that kind of money, it’s more than a blip on the radar. And that was part of our payback as well.”

Payback? Finally, there’s a positive turn for Ann Arbor’s story, and not surprisingly, the path began with an AMI solution, employing a STAR Network system from Aclara RF Systems, Hazelwood, MO. Aclara has deployed the system in many other cities, such as New York City, NY; San Francisco, CA; Boston, MA; and Beverly Hills, CA. For the meters, Elster AMCO Water, Inc., Ocala, FL, supplied its C700 positive displacement meters and AquaMaster electronic cold-water meters.

Ann Arbor had an immediate need for some of the basic features, including billing, high/low-consumption reporting, and non-revenue water loss detection. Although quarterly billing is still the norm, daily reads have allowed for the option of monthly billing if the customer signs on to an automated e-billing program. Overall, the data has improved operations and reduced costs associated with the character of area’s population. “I don’t have exact figures,” says Welser, “but we’ve heard as high as 50% of the properties in Ann Arbor are rentals. And we have a significant number of residents that are snowbirds who fly south for the winter.”

With the high percentage of mobile residents, water meter billing records and customer accounts change often, but having daily reads allows for opening and closing accounts without the cost of sending workers to disconnect and reconnect meters. Residential customers also saw a reduction in their costs because the accurate data allowed the city to restructure water rates in a manner that assigned the cost of peak usage to the entities responsible. According to Paul Lekan, vice president of marketing at Aclara, a perfect example is the University of Michigan.

**TAMING THE BIG FLUSH**

“One of the biggest buildings is the sports arena, and six times a year over 100,000 people walk into that building to watch a football game,” explains Lekan. “At halftime everybody goes to the restroom, and it’s called the ‘big flush.’ The water system experiences a spike of 30 to 60 minutes during the big flush, and it taxes it like nothing else. In the old way of doing business, everybody shared the burden of that flush. But with AMI data, GIS tools, and asset management, they set up rate classes and shifted the burden to those that cost the most to serve.”

Success stories like Ann Arbor’s are driving a surge in the adoption of smart metering systems, according to a study by Pike Research, Boulder, CO. The company predicts the market is building to a stampede, with the worldwide installed base of smart and smart-enabled water meters primed to grow to 31.8 million by 2016, up from 5.2 million in 2009. Researchers note that smart meter data produces greater accuracy in billing and has demonstrated reduced water consumption. Additionally, utilities see decreased rates of non-revenue water, lower operating expenses, and reduced customer service calls and complaints. Overall, the cumulative global investment in smart water meters is expected to reach $4.2 billion from 2010 to 2016, with North America accounting for an 80% slice of the pie chart.

It’s also easier to resolve issues from commercial and industrial customers after investing in an AMR/AMI system, notes Jason Bethke, vice president of the FATHOM line of meter data management (MDM) software, at Global Water Resources in Phoenix, AZ. As an owner and aggregator of 16 utilities around the Phoenix area, Global Water began deploying AMI solutions and quickly recognized the need for tools to manage the data and to extract value from it. The company developed FATHOM, an AMI software product that incorporates an array of MDM analysis tools that include hourly reads, real-time presentment, live customer interface, usage alerts, leak notifications, consumption comparisons, and ordinance enforcement.

“With AMI in an industrial scenario, you can answer questions that you couldn’t answer before,” says Bethke. “Commercial customers come and say there’s no way they used that amount of water, but with AMI solutions you can show them how much water they used and exactly when they used it, such as on the first shift at three, to six in the afternoon. Now the customer can look at their processes to see

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where the water goes, and that raises the level of satisfaction. It protects the utility’s revenue and gives the customer —whether they be commercial or residential—the control over their consumption because they now have access to data they didn’t know about before.

“With the data can come up with all kinds of new potential rate designs that represent customers better,” he continues. “But really putting the data in the hands of the customer is the important part. So we’re feeling as an industry that the price of water is going up, whether that’s because wholesale water is more expensive, or treatment costs, or electric power and the aging infrastructure. So you see the price of water go up, and customers are now faced with significant water bills and want to manage that.

“You can’t manage a water bill by looking at what you did last year in the same month — there’s not close enough timing,” he says. “But you can do things like text message a consumer that they had moved from tier 1 to tier 2 in a rate schedule and warn them that they’re on pace to spend over their budget because they’ve used more than 30 to 60% than they did last week. To communicate to customers about their consumption behavior and their spending behavior helps avoid the big bill coming in the mail.”

TIERED RATES STEP UP REVENUES
Structuring a tiered-rate system is another task that’s getting easier, thanks to tools for building detailed profiles of customers, adds Rich Sanders, vice president of business development, Datamatic, Plano, TX. “It’s easy if a utility wants to see something like a profile of all the fast food restaurants in their territory,” says Sanders. “We can reprogram our endpoints by individual ones or by groups, and they can go out and do a group of fast food restaurants, and instead of collecting hourly data, it could be 15-minute data. So they can really look at how those businesses consume water. All the data in our database is Microsoft-based so you can put it into an XL file and run a report that will give you a lot of information.”

Such features appealed to The City of Portsmouth, NH, now in the final phase of a project to automate data collection from its 8,000 water meters using Datamatic’s MOSAIC System. According to David Allen, deputy public works director, Portsmouth, after completing the first 1,200 units in Phase I, they saw benefits including leak detections.

One of the first recommendations to come from data analysis showed that moving to billing monthly rather than quarterly would detect leaks quicker, smooth out cash flow, and improve water management.

Discovering undetected leaks is critical benefit, according to Sanders, “We see a large number of cities on our fixed networks, and the data shows that on any given month about 12% of all end-users have leaks. But when you get a leak alert to a residence within 24 hours, that’s a real benefit to the customer because they’re not seeing a big surprise in their bill that came after a 30- to 60-day delay.”

LINKING UP WITH SCADA
There’s equal enthusiasm for leak detection at the distribution level, notes Doug McCall, director AMI marketing, Sensus, Raleigh, NC, a provider of utility infrastructure systems and resource conservation. “Utilities want a very robust leak detection network, not only to the consumer, but all the way up to the distribution network, along with the software to monitor it,” says McCall.

Moreover, utilities are telling Sensus that they want AMI benefits extended throughout their assets — applications such as monitoring, pH and chlorine levels, pump house operations, and distribution line pressure, to name a few.

“We know that utilities want a SCADA interface because so much of their equipment uses SCADA protocols, and our
SCADA control monitoring network ties right into the AMI network,” he adds.

Once it’s all tied into the network, there’s another factor to consider beyond convenient and efficient asset control—savings.

The opportunities for keeping cash within the utility’s walls come in some obvious areas, such as labor, and some not so obvious, such as the electricity meter in the pump house. For example, The City of Gresham, OR, contracted with Sensus for their FlexNet SmartPoint Transmitters as part of an AMI system that included replacing 16,000 residential water meters. According to Brian Stahl, Gresham’s water division manager, reduced cost factored significantly in the city’s decision to approve the plan.

“By going to AMI, we shed approximately $65,000 to 70,000 of annual costs for meter reading,” says Stahl. “And we avoid having workers go out on disputes for rereads and field checks. Now these things can be done in the office with a few key strokes.”

Welser describes a similar experience for the City of Ann Arbor, where the utility had seven full-time readers and one full-time meter reading technician, plus, three contract readers that logged somewhere between 20 to 30 hours a week.

“At the completion of the core project we were down to zero readers, and one full-time technician,” says Welser. “And we went from five billing clerks to three.”

FROM OVERSIZED TO RIGHTSIZED

Obviously, less labor, more money. But how about more money by weeding out losses from commercial sites with oversized meters? It’s often referred to as rightsizing, says Brian Fiut, senior product manager for Itron, Liberty Lake, WA. For example, think of a large city with a warehouse district that has become gentrified and now plays host to upscale condominiums, office buildings, and shops. The original meters in those buildings were designed to handle industrial scale water usage, and it’s been seen that they often don’t register small flows when serving something like two-dozen offices, or small retail stores.

“It’s easy to detect from those types of loss situations from oversized meters,” says Fiut. “The AMI system allows you to get the data for a particular building, and you have all the hourly reads and can portray that on a graph as flow rates for a percentage of time. As a design engineer, I can reach into the Web browser interface and view 30 days of data as a flow rate against time, and what I may see is that it’s not running at all, and there’s not any consumption. So you know there’s empirical data and evidence that the meter is not the right size to the application. Not only is it a wasted asset, it’s probably not reading accurately.”

Sometimes even an appropriately sized meter can break down or suffer damage, and as water prices rise, commercial customers want to improve their ability to monitor and analyze their usage. According to Morrice Blackwell, marketing manager, Badger Meter, Inc., Milwaukee, WI, industrial customers say that they want to see and track their water usage. Says Blackwell, “There’s a strong connection between pump accuracy and economics. Let’s say a large user has their meter serviced every five years, and they have a very steady usage pattern. They typically schedule a service once a year, but if you’re able to track their profile and that meter goes under a certain percentage of the normal consumption, that can alert

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you that something is wrong.

It’s not always a defective meter. The customer may be using less water because they reduced their manufacturing hours from a three-shift operation to two. But in that case, the utility should be expecting less revenue.

**UNCLOGGING THE DRAIN ON REPAIRS**

Unnecessary repairs are another drain on revenues, and Blackwell notes that hourly data can help avoid the cost and nuisance, as in the case of a utility that had to send technicians out on a daily basis to check the meters of a large hotel because losing a day of revenue could cost thousands of dollars. “Why not monitor those meters remotely, and when the usage profile drops below a certain point, a utility manager gets an alert?” asks Blackwell. “We see that there’s a lot of information to be gleaned from the hourly interval data. Almost anything that customers can dream of. Now that you show them some of the things that can be done, they come up with many more ideas and possibilities.”

Do those possibilities include helping conservation efforts in areas suffering from droughts and shortages? Well, how about the case of the dreaded landscape watering restriction program. In the past, conservation programs often include landscape watering restriction schedules, yet those restrictions were difficult to enforce.

But that’s changed, says Ian MacLeod, vice president of marketing, Master Meter, Inc., Mansfield, TX. “Billing can be creative and include a motivation to conserve,” says MacLeod. “For example, in a fixed-network environment I wouldn’t say that sprinklers have a distinct signature, but the usage pattern is different than running a shower or dishwasher. So an astute utility could see those usage patterns and know when sprinklers were running. If there were water restrictions, they could impose fines that were backed up with real data. Or, the utility could alert residents to report illegal water usage, and the utility would have proof. So this data can back up water restriction plans”

Whether it’s restricted or not, the price of water is rising, and MacLeod notes that time-of-day use (TOU) can help in controlling costs. “If I could log onto a website and understand that 20% of my daily water usage is during the first three hours of my kids coming home from school, I can begin to modify consumption behavior at the house,” says MacLeod.

Moreover, the information doesn’t have to be relegated solely to a website. Alerts by e-mail, automated phone calls, or text messages are typical options, and so, too, the ability to establish water budgets and over-budget alerts. “Maybe you figure you don’t want to spend more than $90 a month on water, and by the middle of the month you’re already at $60, so you can get a text message that you are close to exceeding your maximum per month,” says MacLeod. “So there is the suggestion to cut back and conserve and reduce consumption. That’s an area where you’re going to see the biggest change. It will be when information is shared, how it’s shared, and how it’s presented.”

As customers make use of the data to save water, savvy utility managers are looking to AMI as a resource in conserving the energy used to treat and deliver that water.

According to Tim Berson, director of product management, North Star Utilities Solutions, Seattle, WA, easy access to the online data from a customer or commercial category lets utilities analyze their usage and establish goals to reduce operational costs. “Essentially you measure the ability [of a customer] to conserve water and shift their consumption to reduce the cost of operations for the water utility,” says Berson. “So it’s possible to work with industrial and commercial customers in regards to driving conservation goals. And not only for reducing their water costs and consumer costs, but also reducing the total electrical cost for the utility to produce and treat water.”
As customers make use of the data to save water, savvy utility managers are looking to AMI as a resource in conserving the energy used to treat and deliver that water.

online community for sharing business processes and discoveries. “It’s like a user forum but something more because utilities can submit their tools and we have validated that they can work in our system,” says Berson. “We make it available for download, and it’s really created a feeling among utilities that they aren’t alone out there.”

Planning departments are also coming up with new ideas and ways to use the data. For example, Brian Fiut at Itron heard from a customer in Oklahoma that wanted to export their AMI data to calibrate a hydraulic load model (a mathematical model that uses variables to analyze and design distribution systems). Why go through the calibration step? If, for example, there is a subdivision planned to connect to a particular distribution node a calculation is needed to determine if the distribution pipe and substation can handle the load.

“Here’s the problem,” says Fiut. “These hydraulic load models are just that, models from a formula, and you don’t really know if they’re right or wrong; it’s just the best guess. But now you have access to all of your old data, and with granular hourly flow data in the system for the last year, you can compare that data to the model to confirm the calculations.”

How about using the data for obtaining funds for capital improvements? It’s happening today, says MacLeod, recalling an account that was looking at AMI with some urgency, even though the area’s geography made it a complicated investment in infrastructure. “Their reason was the availability of stimulus money or some sort of package from the government for infrastructure improvements, but the utility had to demonstrate that their unaccounted for water was less than 8%, and they had to show improvement in their water loss numbers,” he adds.

It was the ideal situation for an AMI or mobile AMR solution with real-time clock, where the system could provide real-time synchronized readings between how much water is produced and how much is consumed. “They’re able to get a very accurate understanding between hourly production and billing,” says MacLeod. “Something like 5% would be a very acceptable number. But the point is it’s not necessarily a return on investment that’s driving these decisions. It could be a need to qualify for money from the government, and AMI can drive down and quantify improvement in unaccounted for water.”

Ultimately, utilities across the US are proving that AMI can drive down costs in unaccounted water, plus other important areas, such as energy, labor, conservation, capital investment, forecasting, billing, and customer service. It’s an impressive list, but no doubt, it’s destined to grow as the technology and meter data management tools continue to improve.

Ed Ritchie is a writer specializing in energy, transportation, and communication technologies.

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