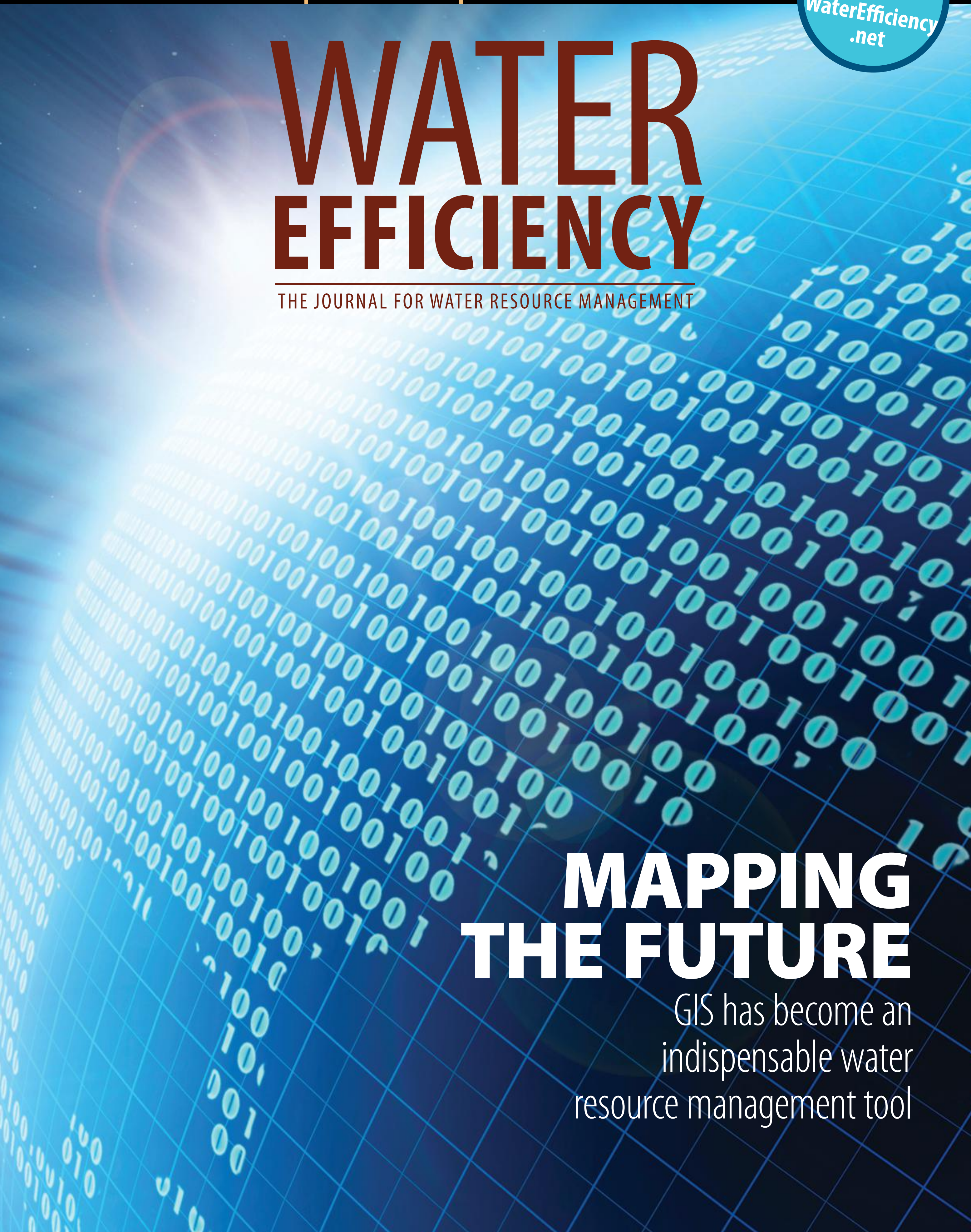
MAY/JUNE 2011

SMART IRRIGATION | METERING | DEMAND MANAGEMENT

Breaking news at WaterEfficiency.net

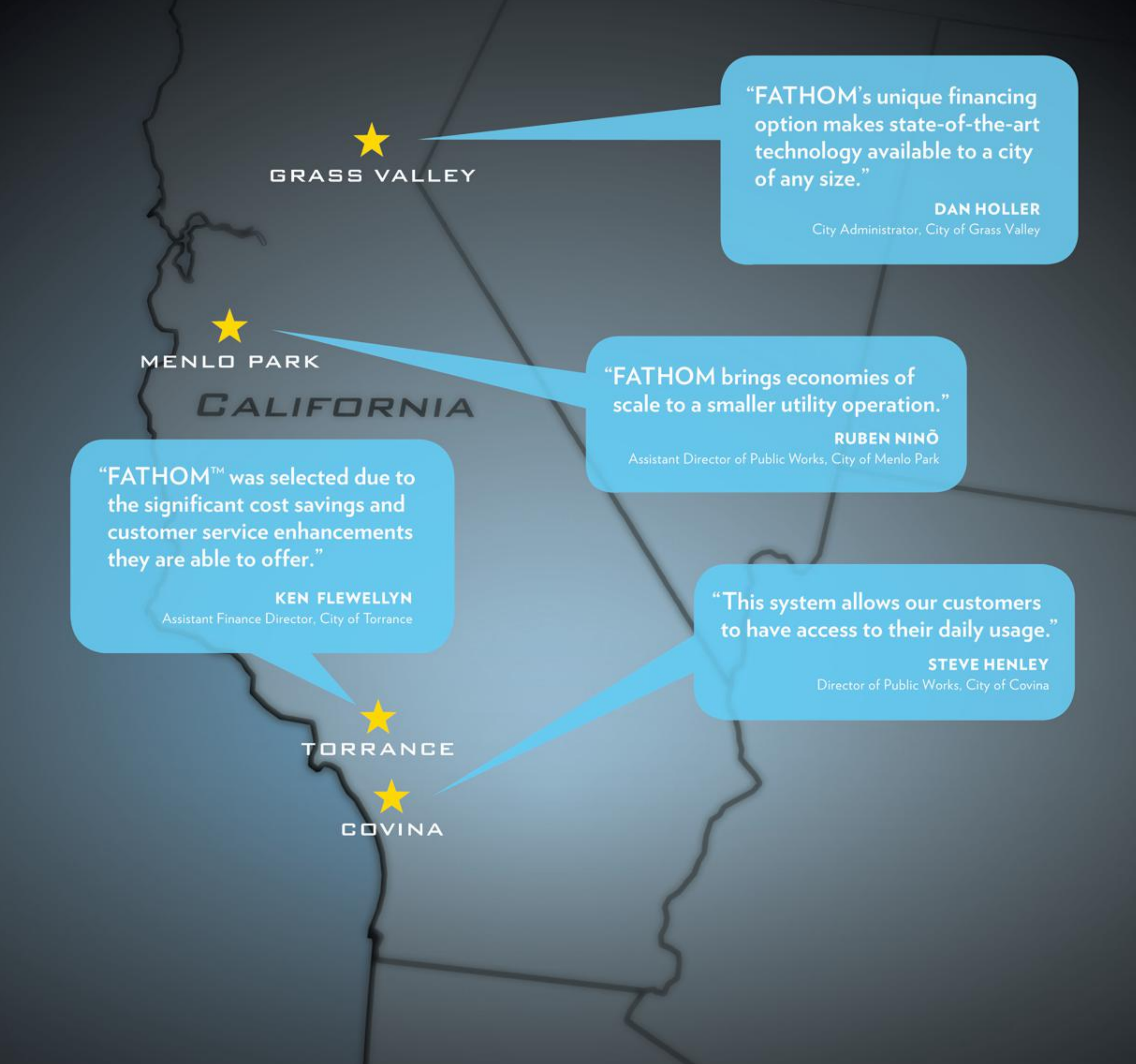
WATER EFFICIENCY

THE JOURNAL FOR WATER RESOURCE MANAGEMENT



MAPPING THE FUTURE

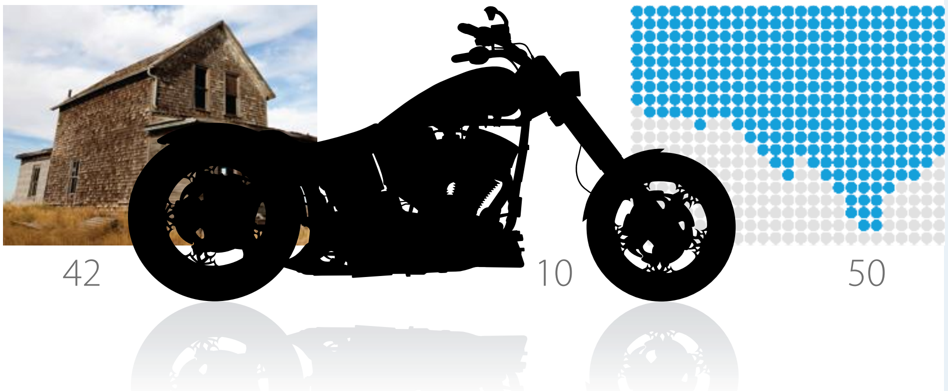
GIS has become an indispensable water resource management tool



HOW DO YOU CUT COSTS WHILE EXPANDING SERVICE? JUST ASK CALIFORNIA.

FATHOM by Global Water is changing the utility game in the Golden State and beyond. Our integrated, Utility-to-Utility (U_2U™) technology allows municipalities to increase efficiency as they expand their customer service offering. With Advanced Metering Infrastructure, Customer Information System and Asset Management capability, FATHOM helps smaller cities upgrade without the traditional time and capital barriers. With FATHOM, every town can afford to be a better water utility. Call us at 1.855.FATHOM1 (1.855.328.4661) or visit gwfathom.com.

GLOBAL WATER
Rapid. Proven. Guaranteed.
FATHOM™



departments

Sign Up for Your Free Subscription
Go online for new subscriptions, renewals, or change of address: **www.WaterEfficiency.net**

WATER EFFICIENCY (ISSN 1934-8479) is published six times a year, bimonthly, by Forester Media, Inc., 2946 De La Vina Street, Santa Barbara, CA 93105, 805-682-1300, fax: 805-682-0200, e-mail address: ***publisher@forester.net***, Web address: ***www.forester.net***.

Periodicals class postage paid at Santa Barbara, CA, and additional mailing offices.

POSTMASTER: Please send address changes to WATER EFFICIENCY, 440 Quadrangle Drive Ste E, Bolingbrook, IL 60440.

Changes of address can be completed online at ***www.waterefficiency.net/subscribe*** or mailed to 440 Quadrangle Drive Ste E, Bolingbrook, IL 60440; please provide your mailing label or old address in addition to new address. Include zip code or postal code. Allow two months for change.

Editorial Contributions are welcome. All material must be accompanied by stamped return envelopes and will be handled with reasonable care. However, publishers assume no responsibility for safety of artwork, photographs, or manuscripts. Every precaution is taken to ensure accuracy, but the publishers cannot accept responsibility for the correctness or accuracy of information supplied herein or for any opinion expressed.

Subscription Rates: 6 issues of WATER EFFICIENCY are $72 per year in US, $90 in Canada, $150 elsewhere. Send the completed subscription card with a check to WATER EFFICIENCY, 440 Quadrangle Drive Ste E, Bolingbrook, IL 60440, fax with credit card info to 413-513-6380, or order online at ***www.waterefficiency.net/subscribe***.

Reprints: All editorial material in WATER EFFICIENCY is available for reprints. Call 805-682-1300 x128 or e-mail ***reprints@forester.net*** for additional information.

Back Issues may be ordered (depending on available inventory) for $12 per copy in US, $15 in Canada, $30 elsewhere.

Send written requests for back issues along with check or money order in US funds payable to WATER EFFICIENCY, PO Box 3100, Santa Barbara, CA 93130, USA. Provide address where the copies should be shipped to. Allow six weeks for delivery.

Group Editor
John Trotti

Editor
Elizabeth Cutright

Production Editors
Brianna Benishek
William Warner

Ad Sales Manager
Ron Guilbault

Senior Account Executives
Michael Ashby
Mark Gersten
Geoff Solo

Account Executives
Michelle Maple
Eileen Duarte
Julia Dawson

Sales & Marketing Coordinator
Stacy Brostrom

Design Department Director
Joan Lloyd

Senior Graphic Designer
Judith Donlon

Graphic Designers
Michele Miotto
Deja Hsu

Production Technicians
Doug Mlyn
Ernie Witham

Web Site Editor/
Web Development; IT
Khalid Khan

Conference & Events Director
Steve Di Giorgi

Conference Sales & Marketing
Scott Nania

Financial & H.R. Manager
John Pasini

Accounts Payable/
Accounting Assistant
Amanda Bridgers
Janet Cooke

Director of Circulation
Steven Wayner

Director of Education & Training
Stephanie Moret

Administrative Coordinator
Emily Olson-Masker

Publisher
Daniel Waldman

FORESTERMEDIA

The Smart Grid for Water

The power and potential of the data

Dr. Peter Gleick of the Pacific Institute recently wrote that due to limitations on water supply and the high costs of developing alternative supplies, maximizing the efficiency of water use is paramount to achieving sustainability. He notes: "A key to improving efficiency is understanding where, when, and why we use water" (Gleick 2010). Unfortunately, data of this granularity is hard to come by in the water industry. In most utilities, data is a sparse commodity or is collected in such vast and widely varying platforms that interrelationships are missed or remain hidden.

The development of the Smart Grid for Water is challenging this approach, by increasing the availability of data and information. The Smart Grid for Water can tell us not only *how much* water is used, but *where* and *when*. The Smart Grid for Water represents a paradigm shift from a data-poor, hardware-centric model, to a data-rich environment that is 100% accurate and complete with location and GPS coordinates. This new approach has created the "Geo-Temporal Data Model", providing the "where, when, and how" necessary to understand water use.

The future for efficient utilities lies in collecting and analyzing this data, and converting it in real-time to information. To be successful, we will need to increase our data awareness by:

- increasing the amount of data (data density) available to the utility and its customers;
- increasing the capability of our systems to manage and analyze this data; and
- increasing our ability to present this information in meaningful ways to shape behavior patterns of customers and the industry.

INCREASING DATA DENSITY

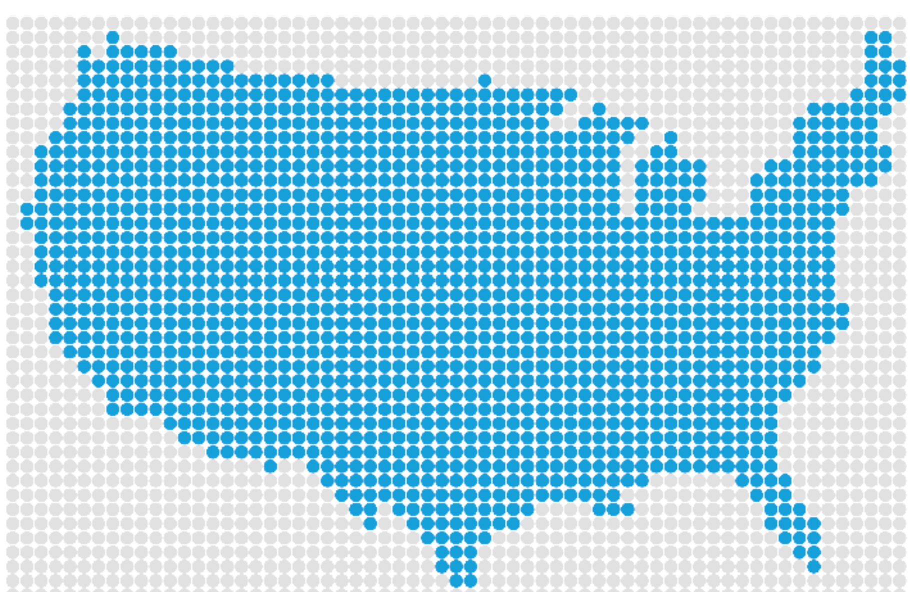
In the past, water utilities employed a data-poor model upon which to make decisions. One read per month—or worse, one read per quarter. Automated meter reading (AMR), while notionally increasing the data density available to the utility, in many cases only supplanted the meter reader. The result: one read per month. There was no increase in available data, but timeliness and accuracy were arguably increased.

Moving to a true "data-rich" model requires Advanced Metering Infrastructure (AMI) with its attendant communication backbone and increased frequency of reads. When combined with geo-spatial referencing, the data model achieves the data-rich capacity of the Geo-Temporal Data Model.

The transition from a "data-poor" condition to a "data-rich" environment not only provides better information upon which to base decisions, but increases the speed at which those decisions can be made. For example, by deploying a system that can provide real- or near-real-time water-pumped versus water-delivered reports, a leak can be recognized immediately. Water theft can be identified rapidly. Missed meter data can be noticed instantly.

But such data-rich systems are a double-edged sword. The vast quantities of data accumulated can easily overwhelm information technology (IT) systems and the human capacity to assimilate. It is the pitfalls of data management and analysis that hinder the successful integration of utility data systems into the Smart Grid for Water and prevent transforming these databases into a coherent *information system*.

Utilities often struggle with the AMI data tsunami. Management systems designed for one meter-read per month



ISTOCKPHOTO.COM/SX70

are now seeing 720 reads per month. A "simple" meter read is now represented by a data stream that is three orders of magnitude above what many systems can handle. And it does not stop there. When additional data such as leak/tamper flags, time/date stamps, peak/average flow tags, etc. are factored in, the data volume increases exponentially. As with many data collections systems, in the Smart Grid for Water, the bottleneck has shifted away from the data collection to data analysis (Baraniuk 2011).

The benefits of the Smart Grid for Water data can easily vanish in this data tsunami. The result is that, in many cases, data collection is "dumbed down" to the lowest common denominator of the systems. This could be a limitation on the customer information or billing systems platform (e.g., systems can only accept one read per month), a limitation on storage capacity (physical or virtual), or a limitation on the ability to comb through the data to create information (analytical capacity and capability). In these cases, the increased data availability becomes a curse, and the response can be to rapidly reduce data collection from 720 reads per month back down to one. The utility has just inadvertently bought itself a very expensive meter reader.

INCREASING DATA ANALYSIS

The Smart Grid for Water has been erroneously defined as the "hardware-centric" AMR/AMI systems; that is, focused around the end-point and the communication infrastructure. But it will prove to be much more. The power of the smart grid is in the convergence of hardware, data, and software to search for and identify trends in data streams, and maximize the efficiency of water delivery, customer service, and utility operations.

Some of this analysis is already embedded within the AMI systems or meters themselves. For instance, leak detection and tamper flags are processed signals that are derived from raw data in the endpoint or meter register. This frees the human operator from divining this information from the raw data.

But the real benefits of the Smart Grid for Water lie in aggregative, integrative, and derivative information that can be gleaned from combining data, particularly from those three critical databases that all utilities have or should have: Customer Information Systems databases answering the question "who, coupled with financial information"; AMI databases, answering the questions "how much, and when"; and geospatial databases answering the question "where".

That is reviewing data from numerous sources and developing tangible, actionable information. Under this approach, a meter read is not just a meter read. It forms a key part of the billing record; it forms a fundamental part of the leak loss (pumped versus billed) analysis; it establishes peak and average demand parameters; it is a key measure of the performance of water conservation activities; it forms the basis for feedback to the consumer directly on their impact on resources; and it is the foundation for key reporting elements associated with regulatory requirements such as compliance with California's 20 x 2020 Water Conservation Plan.

The key is that while this information is aggregated and derivative, the data source itself is singular. There is no need to store this data point across multiple platforms. Gather the data once; use it many times. A recent International Data Corporation report notes that "nearly 75% of our digital world is a copy—only 25% is unique," and "the greatest challenges are related not to how to store the information we want to keep, but rather [in] extracting all of the value out of the content that we save" (Gantz and Reinsel 2010). A properly deployed smart grid for water provides the analytical tools to solve this dilemma.

INFORMATION PRESENTMENT

Having masses of data and the algorithms to reduce it to information are only as good as the tools provided to people to action the information. Information presentment represents the kernel of actionable information from the data: something that can be done, a change made. It can take the form of instantaneous water-pumped versus water-billed reports reconciling flows on a daily basis, maps of unauthorized water usage, egregious water users, or super-conservers! Or it can demonstrate to consumers their water consumption versus their neighbor's or their community, or allow them to track daily their gallons per capita per day on a year-to-date basis.

But these information presentment tools are often ignored. As the volume of data increases, "the extra effort of making our data understandable, something that should be routine, is consuming considerable resources" (Fox and Hendle 2011). Survival in the smart grid for water data universe will depend on our ability to manage data and turn it into information. The ease at which we can take smart grid data, convert it into information, and present it in a form that results in change will determine the success of any smart grid installation.

REFERENCES

Baraniuk, Richard G., More Is Less: Signal Processing and the Data Deluge, *Science* 331, 717 (2011), 11 February 2011.

Fox, Peter and James Hendle, Changing the Equation on Scientific Data Visualization, *Science* 331, 705 (2011), 11 February 2011.

Gantz, John and David Reinsel, *The Digital Universe Decade – Are You Ready?* p. 9, May 2010 ***http://idcdocserv.com/925***.

Gleick, Peter H., *Roadmap for sustainable water resources in southwestern North America*, Proceedings of the National Academy of Sciences, Published online before print December 13, 2010, doi: 10.1073/pnas.1005473107 PNAS December 14, 2010 vol. 107 no. 50 21300-21305 ***www.pnas.org/cgi/doi/10.1073/pnas.1005473107***.

WE

Trevor Hill *is president and CEO at Global Water Resources.*

See similar articles at:
www.WaterEfficiency.net/resource-management