By Amir Peleg

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Investment in smart water networks on the rise

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The World Bank pegs the annual global value of water produced and lost by utilities at close to $14 billion. In the United States, this problem is exacerbated due to a huge funding gap between water infrastructure needs and current spending. According to the American Society of Civil Engineers, unless new investments are made in the U.S., unreliable water infrastructure will cost the average American household $900 annually in higher water rates and lower wages. The cost for businesses by 2020 will amount to $147 billion, with the economy losing 700,000 jobs by then. Clearly, better management of water resources is essential.

Sophisticated smart water technologies are changing the way water networks are monitored and controlled. As the maturity of these technologies increases and the deployment process becomes easier and faster, more and more utilities are adopting a "smart network" approach. Studies show that the global market value of smart water technologies is expected to quadruple in the coming decade, from $5.8 billion in 2010 to $22.2 billion in 2020.

As chairman of the Smart Water Networks Forum (SWAN), I have witnessed this growth firsthand. Smart, data-driven technologies have resulted in a rising tide of information being available for operators. In the aftermath of the first wave of real-time data sources, which includes sensors, meters and telemetry, the challenge is for water utilities to make sense of this sea of data effectively and transform it into business intelligence to better inform operational, maintenance and planning decisions.

Despite living in a time of instant access to media and information, many water utilities are burdened by delayed access to information (and not just raw data) that, if known earlier, could have saved resources and minimized damages. The need to manage water networks in real-time with online data transmission and real-time analysis is therefore becoming a higher priority for regulators and utility companies alike.

Water network monitoring is a novel approach that uses data analytics and statistical modeling to help utilities to gain valuable operational knowledge. Through this solution, utilities can identify where problems are occurring, quantify them, locate them, prioritize their actions, assess the work required, dispatch maintenance crews if needed and more. This insight can further support decision-making on how and where to target resources for preventative maintenance to minimize serious and costly disruptions of service. Below are a few key features of water network monitoring.

The ability to provide full visibility into water networks

Water utilities today spend significant amounts of money purchasing, installing and maintaining sensors along their distribution networks. More sensors equate to higher network visibility. Every day, hour or minute in which a meter is not sending accurate data, however, translates into system losses. Water network monitoring enables early detection of faulty sensors, allowing for immediate action and quick return to normal network visibility.

Water network monitoring works by automatically and remotely processing available network data, therefore reducing detection cost and saving time for both office and field teams. This approach is based on a utility's existing online data (flow, pressure, water quality) taken from sensors and loggers along the network, as well as additional data sources (e.g. GIS, calendar), that is all transmitted to a central location. The collected information is then used to identify, characterize and provide alerts on evolving conditions and trends. When an anomaly is detected and classified, a real-time alert is issued. Utilities may then prevent or respond to various network inefficiencies such as leaks, bursts, zone breaches, water quality issues, meter faults and other operational malfunctions. Executives are provided with full network overview through personalized dashboards and performance metrics.

Using smart water solutions to save water, energy and system costs

The average American utility can save up to $2 million per year by using water network monitoring, which typically reduces non-revenue water levels by 25-35 percent during the first 12-18 months of usage. This figure is based on research conducted by the American Water Works Association, which found that the average American utility had an annual cost of

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$5.81 million in 2012 due to non-revenue water.

The use of water network monitoring helps minimize water loss and energy consumption, while prioritizing utility operations. Studies by water experts at Navigant Research show that the average American water utility loses up to 30 percent of its water supply through leaks or un-billed usage. Some leaks are ongoing and are not detected for months or even years, leading to continuous water loss. A leak's lifetime can be reduced dramatically through constant monitoring. Utilities can identify leaks before they are visible and treat them immediately to reduce water loss. This in turn improves customer service by preventing service interruptions and avoiding major repair costs.

Energy is required in most stages of water production and distribution. The use of water network monitoring can help lower operating costs in terms of the energy needed to pump, treat and pressurize water systems. The less water lost through leakage, the less water has to be produced, treated and transported. For water utilities in areas with geographical height differences, the energy savings by network monitoring is two-fold, as transportation of water to high areas also requires a great deal of energy.

In such cases, even if water is not lost, but only breaches from a high pressure area to a lower pressure area, the impact in terms of energy waste is fundamental. Inefficiencies of this kind can go on for a while, with costly energy used to pump water that, after getting to the top, just flows downstream again to repeat the cycle. Such issues, when discovered by a monitoring system, can have a high impact on energy savings. The earlier the inefficiency is discovered, the more energy is saved. Reducing leakage levels can also help reduce chemical treatment costs and the need for costly construction projects.

Encouraging proactive system management by identifying problems in advance

Water network monitoring provides reliable and consistent information about water distribution networks and uncovers network issues early, allowing water utilities to mitigate risks related to water quality and water loss and reduce the total expenditure on water production and delivery. Timely warning and analysis of network anomalies allows a utility's operational staff to react before a visible and costly failure develops, energy is wasted or quality degrades. The potential for early detection depends on the frequency of data used by the monitoring system. The more frequent the data transmissions, the earlier problems can be detected.

By using a monitoring system, utilities can realize direct cost savings and improve customer service by preventing bursts. Most bursts start as small leaks and grow gradually until they "pop." Finding these leaks and repairing them when they are still small can prevent a significant number of bursts. Other bursts are sudden. In such cases, if the system receives frequent data from the available sensors, an online monitoring system can identify the burst and help locate it before it becomes visible. As a result, network operations can become more water and energy efficient, while damages and repair expenses are reduced.

Water network monitoring can also prevent water contamination and aid long-term planning. Early intervention can reduce water contaminants and help utilities comply with water quality regulations. Being able to access and share data on a single platform can support decision-making and improved collaboration around a broad range of activities across multiple stakeholders. In addition, network monitoring can provide recommendations as to the optimal location of additional sensors that will further increase the detection resolution.

In conclusion, the combination of online monitoring systems with frequent data transmissions from multiple types of network sensors can provide water agencies with invaluable real-time visibility across their networks. Following in the footsteps of advanced monitoring networks like as those used in the electricity and telecom industries, the water industry is moving towards implementing smart networks. With more solutions becoming available and the benefits becoming more pronounced, water utilities throughout the U.S. and around the world will increasingly look to invest in smart water technologies to enhance network savings and operational efficiency. **WT**

Amir Peleg is the founder and CEO of TaKaDu, the global leader in water network monitoring. He also serves as chairman of SWAN — the Smart Water Networks Forum. TaKaDu has been recognized as one of the most innovative water technology companies in the world, and TaKaDu's Software-as-a-Service (SaaS) solution is used by water utilities worldwide to efficiently manage their water networks. In 2013, TaKaDu formed a partnership with Psomas, headed by Jacob Lipa, Psomas' President, to offer TaKaDu's cloud-based solution to U.S. water agencies. Amir can be reached at Amir.Peleg@takadu.com.