



Complex and Cost-Effective

New real-time energy management system for water distribution. BY SANJAY PATEL

WATER AND ENERGY are two critical, mutually-dependent resources; the production and distribution of which are major expenditures for government. Energy production (including thermoelectric cooling, hydropower, energy mineral extraction, and mining), fuel production (including fossil fuels, biofuels, and other non-conventional fuels), and emission controls all rely on large amounts of water.

Likewise, large amounts of energy are needed to extract, convey, treat, and deliver potable water, as well as treat and dispose of wastewater.

According to the International Water Institute, the water sector represents around three per cent of the world's energy demand, with variations among different countries and cities. The Institute's 2014 report, "Energy and Water: The Vital Link for a Sustainable Future" indicates that energy consumption by public drinking water and wastewater utilities, which are primarily owned and operated by local governments, can represent 30-40 per

cent of a municipality's energy bill. At drinking water plants, the largest energy use (about 80 per cent) is to operate motors for pumping.

Energy is the second-highest budget item for water utilities, after labour costs, so energy conservation and efficiency are issues of increasing importance. Opportunities for efficiency exist in several categories, according to the Congressional Research Service's 2017 report on the "Energy-Water Nexus." These categories include upgrading to more efficient equipment, improving energy management, and generating energy on-site to offset purchased electricity. However, barriers to improved energy efficiency by water and wastewater utilities exist, including capital costs and reluctance by utility officials to change practices or implement new technologies.

The complexity of a water network in major cities and smaller communities alike means there are a variety of ways a utility could distribute the water

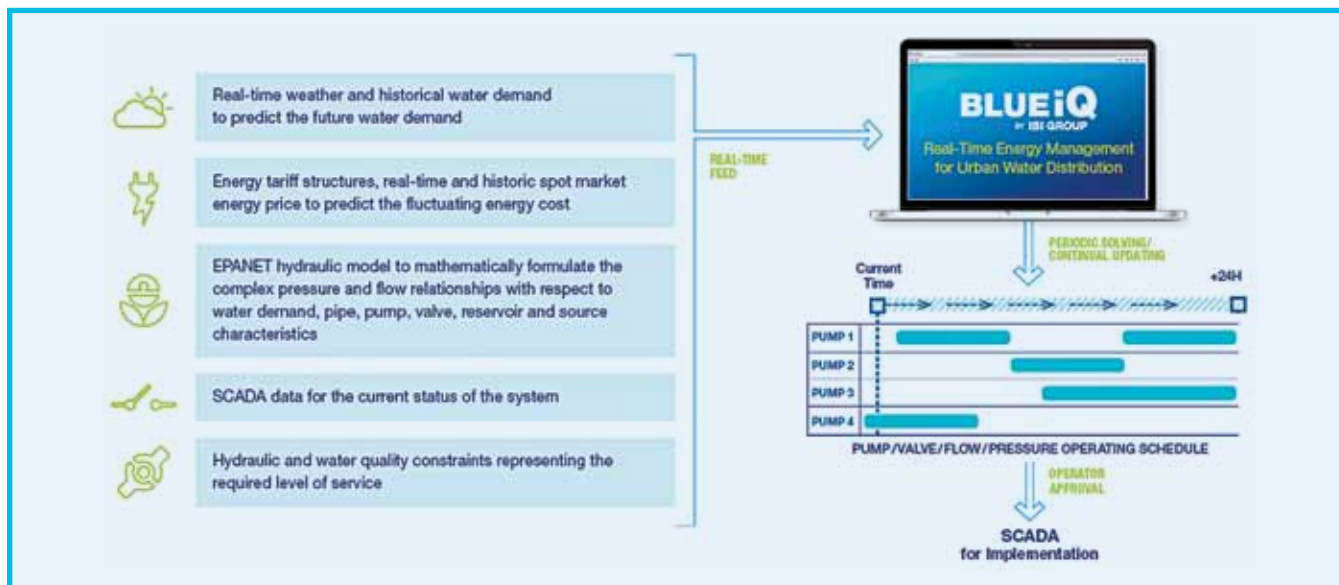
around the system. What is the most energy efficient and cost-effective pumping strategy to provide the required quantity of water and level of service to customers? This dilemma remains an ongoing challenge for water utilities across North America. To help solve this challenge, global technology and design firm IBI Group, developed BlueIQ, a real-time energy management solution for water distribution.

New water distribution tech

IBI Group's BlueIQ integrates with supervisory control and data acquisition (SCADA) to assist in identifying the optimal pump and valve schedule in real time to reduce overall operational costs. Using various real-time input data feeds, it's a system-wide, non-linear formulated solution optimizing quickly enough to be used immediately, while the hybrid automation aspect still gives the overseeing operator decision-making control.

With the utilization of existing water distribution assets, the BlueIQ software

Credit: IBI Group



provides predictive analytics and optimization of the following:

- Factoring in current weather and historical water patterns to predict future demand;
- Energy tariff and spot market energy pricing to predict fluctuating unit energy costs;
- The EPANET hydraulic model to mathematically formulate the complex pressure and flow relationships;
- SCADA data; and
- Hydraulic and water quality constraints.

The formulation allows for a rolling, forward-looking pump, and valve schedule to be optimized periodically and quickly enough for immediate use. A cost-effective operating strategy to provide customers the required level of service is maintained, despite unexpected variations and changing system conditions.

Blue IQ in the big smoke

The Toronto Water Transmission System covers the City of Toronto and southern portion of York Region. Serving a population of 3.4 million, it is the largest water system in Canada and one of the largest in North America. With water being treated at four filtration plants located on the north shore of Lake Ontario, and then transported to higher elevation pressure districts throughout the system through pumping stations, storage reservoirs, elevated tanks, and

approximately 500km of transmission mains, its interconnectivity is complex.

BlueIQ provides Toronto Water’s Pump Control Officers with optimal operational strategy, regenerated and updated in eight-hour intervals, which has resulted in an energy reduction of eight million kWh annually, and results in savings of \$1 million.

“This is a completely new technology package that provided a customized solution for Toronto. Combining all the real-time inputs, with an accurate calibrated hydraulic model, and generating a proven and effective advanced pump schedule has significantly reduced Toronto Water’s operating costs,” says Gary Thompson, area supervisor of process, operations and maintenance for Toronto Water.

Originally developed for the City of Toronto in 2015, IBI continues to fine-tune the software and look for added efficiencies. The firm is currently working on an artificial intelligence (AI) algorithm which will support the BlueIQ software to deepen the accuracy of its predictions, ultimately saving water utilities more money in energy costs, with an even greater reduction in greenhouse gas emissions. The intelligent solution contributes to the firm’s smart city offering, and supports its new strategic plan.

“BlueIQ is an exciting product which has been in development by our Intelligence team since 2012,” says Scott Stewart, IBI Group CEO. “As we continue

to work with cities and municipalities around the world to support the adoption of smarter and more efficient infrastructure, we see the launch of BlueIQ as an important next step in the firm’s technology-driven future.”

As cities and municipalities continue to identify “smarter” operational solutions—looking for ways to reduce overall energy consumption and contribute to a more sustainable future—predictive technologies with optimization will be sought-after tools. These technologies are capable of analyzing large amounts of data in near real-time, resulting in faster and more effective decision-making.

For water utilities, providing the required quantity and level of service is of utmost importance but there is often flexibility in how this can be delivered. BlueIQ allows utilities to make more informed decisions with more of the available data, allowing for a more sustainable and financially stable solution for water distribution assets. WC



Sanjay Patel is IBI Group project lead for water optimization solutions.

For further information, visit ibigroup.com/blueiq

