

# STATE OF THE

## Plotting a course through the tangled maze of energy and water

### Experts address energy efficiency and generation from multiple perspectives

**M**anaging energy wisely always has been important to the water sector. Recently, though, the discussion has intensified beyond reducing energy use to reaching full energy neutrality and even energy production while treating wastewater.

The paths to reach this new goal vary among water sector professionals, but one conclusion for optimizing energy efficiency crosses all boundaries: success will require collaborative energy.

Bringing the right people together is the key element of minimizing energy use, achieving energy neutrality, or even producing energy in the water sector. The examples below show a range of what some have done already and new opportunities that exist to balance the larger water and energy equation.

#### Water, energy, and food

At WEFTEC® 2016, the Plenary Session 102, Industrial Water and the Water/Energy/Food Nexus, brought together panelists from government, industry, and academia to discuss the intersection of these vital areas. Without proper interaction and collaboration, these areas risk destabilizing each other.

Kathleen Hogan, deputy assistant secretary for the U.S. Department of Energy (DOE), provided details on many DOE-supported energy projects to address water resources.

Hogan grouped the projects into three categories:

- clean water production technologies;
- energy efficiency in wastewater treatment; and
- reduction of water demands from

industry, targeting manufacturers, water resource recovery facilities, and industrial facilities.

The same idea ran through all three groupings – in Hogan’s words, DOE is “looking to be very strong partners in this space.”

For example, Hogan described the 3-year Better Building Wastewater Infrastructure Project. Under this accelerator project, nearly 75 water resource recovery facilities are setting long-term targets to improve energy efficiency by 30% or more, developing sustainable infrastructure plans, and assembling a package of energy conservation and resource recovery methods as well as a concrete financing model.

Rabi H. Mohtar, professor of agricultural engineering at Texas A&M University (College Station), posed the question, “What’s new in the water/energy/food nexus?”

His answer reflected the sentiments of the other panelists – that coordination and collaboration are essential. “It’s very important to realize that we need all of these pillars moving forward. It is all of the above,” Mohtar said. “...The message here is that ‘interdisciplinarity’ can only exist if you have strong disciplines, and we need the strong pillars of energy, food, and water to build a sustainable platform.”

Amanda Brock, founder and CEO of Water Standard (Houston), summed up the nexus simply: “While water is a pillar, it also is what everything projects around. Because without water, there is no energy, there is no food. Without water, we die.”

She added that securing water sources in a rapidly changing environment is a key concern. The four main sources are

- rivers, lakes, and groundwater;

- conservation;
- reuse; and
- desalination.

Finding the balance in allocating this finite resource among energy, food, and other needs requires an understanding of the true distribution of uses among different sectors.

She described how perceived usage of water by the oil and gas industries often is over represented in the media when compared with how much water they actually use. For example, Brock cited studies that estimate 9 years of hydraulic fracturing water use to be 946 billion L (250 billion gal) – less than 1 day of consumptive water use in the U.S., she said.

Snehal Desai, global business director for Dow Water & Process Solutions (Midland, Mich.), provided the final voice on the panel. He concluded the discussion with a viewpoint from the industrial sector. He described efforts to reuse water multiple times within a facility for various purposes.

Desai also commented on the complexity and scope of the entire water/energy/food nexus. He warned against trying to figure out the broad strokes too fully before smaller pieces are put into place. “If you make it small enough, it’s manageable. It’s when we think we’re going to do a national water policy that our heads explode,” Desai said.

“We will get there, but it’s going to be a series of small programs from around the country that get the bigger picture painted.”

#### Next level perspective

When dealing specifically with municipal wastewater, Bruce E. Rittmann, director of the Swette Center for Environmental Biotechnology at Arizona State University (Tempe), is encouraging wastewater

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professionals to “graduate” from thinking about wastewater to thinking about its inherent resources. Chief among these is energy.

Rittman presided over the annual WEFTEC Scientist’s Luncheon, hosted by the Association of Environmental Engineering and Science Professors (AEESP; Washington, D.C.) and the Water Environment Federation (Alexandria, Va.). His presentation was titled “From Treatment to Resource.”

He advocated rethinking treatment systems with the use of the effluent in mind. He also described the activated sludge process as “an expensive way to squander valuable resources.”

As an alternative, he suggested choosing processes that treat water only to the degree needed for its next intended use. Choosing not to remove some contaminants can defer a tremendous amount of energy use.

For example, domestic wastewater can be converted to liquid fertilizer (with the bonus of irrigation water) or for some industrial uses while avoiding the processes needed to remove nutrients.

He described being able to more readily use established processes, such as methanogenesis, that can extract energy while treating water. This improvement comes by leveraging newer technologies, such as staged anaerobic fluidized membrane bioreactors (SAF-MBRs), to

make these processes more achievable.

The idea of customizing the treatment of water to its end use varies vastly from the idea of removing pollutants from water to release it to the environment, he said. The processes and technologies needed to make great strides are either available today or developing, he said.

The real challenge, according to Rittman: “You have to change minds and develop the markets.”

## Changing the culture

Getting one utility to take steps to optimize energy usage is good. Getting several to do it is better. Having that group work through the process together and on similar schedules can reap even greater benefits.

Layne McWilliam from Cascade Energy (Portland, Ore.) shared the value his program has found in grouping several utilities together into a cohort to encourage energy savings programs. Multiple facilities of different sizes form each cohort. They create peer relationships that promote knowledge sharing and offer opportunities to test ideas and validate results.

McWilliam presented his perspective in Technical Session No. 317, The Upward Trend: Optimizing Energy from Net Neutral to Net Positive, at WEFTEC 2016.

He advocated reaching beyond the traditional confines of wastewater treatment to also find lessons from the drinking water and energy management sectors. The training walks facilities through team assembly, policy adoption, baselining, facility analysis, and implementation. The onsite work gives the cohort members time to think about these changes, as well as to receive coaching, while removed from the everyday demands of their facilities.

Tracking the results from the implemented changes builds the framework, skills, and confidence for lasting cultural change and successful energy management over the long-term.

This sort of wastewater energy coaching “boldly goes where traditional electric utility energy audits fear to tread,” McWilliam writes in his paper.

## Finding the right partners

The consistent message throughout these different water–energy perspectives is the importance of continuing collaboration and innovation. Technology is not the main challenge, though it certainly does add complexity – the real challenge is gaining consensus around a project to choose which path to follow.

– **Steve Spicer**, WE&T

## Building a stronger, faster, more nimble utility

### Wastewater professionals discuss how the sector can have a more resilient future despite obstacles

**T**he wastewater sector is dealing with an ever-evolving world, requiring utilities to be resilient and adaptable. Not only do they have to prepare for natural disasters and purchase or refurbish equipment to meet stricter regulations, they also face the challenges of climate change and the threat

of bioterrorism.

Several experts at WEFTEC® 2016 in New Orleans shared how utilities can better prepare for the future and respond to these diverse challenges internally while conveying cohesive but informative messages to the public at large.

## Changing your response with the climate

Drought, heavy rains, and climate change are forcing utilities and regions to rethink how they prepare for and respond to their environment.

Don Vandertulip of WateReusEngineers (San Antonio, Texas) noted during Technical