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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

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Session No. 411, Public Health in the Headlines, that the drought in California is unprecedented. There has been a drought in Texas from 2011 through 2014, he said. There are still areas in north Texas that are going through drought such as Wichita Falls, and state climatologist warn temps will only get warmer with evaporation from existing waterbodies, he said.

These droughts are pushing some utilities to adopt direct potable reuse (DPR) practices. Vandertulip said currently, there are two places in U.S. doing DPR: Big Springs, Texas, and Wichita Falls, which is now switching back to indirect potable reuse due to rainfall. The city of Brownwood, Texas, had approved the first direct-to-pipe potable reuse in the U.S., Vandertulip said, but after flooding due to heavy rains, the city put this plan on hold.

## Climate change prep work

During Technical Session No. 320, Urban Resiliency Planning: Are You Ready?, Alan Zelenka, director of energy services at Kennedy/Jenks Consultants (San Francisco), explained weather extremes will only get worse.

"We've got droughts, higher temps, flooding, and forest fires. And if that doesn't depress you enough, it is increasing thanks to climate change," Zelenka said.

He said these factors increase utilities' risks and costs.

"Dealing with our risks and our costs in an effective way is what climate change resiliency is all about," he said.

Zelenka said cities like San Francisco, Los Angeles, and Portland, Ore./Maine, have added climate change adaptation to their resiliency plans. For example, he said, when San Francisco put together the capital improvement plan and analysis of a tunnel that will transport water, the city factored in sea-level rise due to climate change. This changed the design height of the underground tunnel accordingly.

"But medium-to-small utilities typically

don't do [resiliency plans] due to staff and resource constraints," Zelenka said. They are more focused on permit requirements. They also face the challenge of lack of available funding and lack of political will to support these improvements, he said.

But preparing for climate change will give utilities lower costs in the long run. Proper planning can pay for itself in less than a year, in some cases, Zelenka said. And, he added, it will be more expensive to retrofit later.

Utilities also should be aware that some grant funding applications, bond ratings, and insurance coverage now require climate change preparation plans, he said.

The U.S. Environmental Protection Agency (EPA) is offering an additional tool to assist utilities with climate change preparation. That online portal will "provide local leaders in the nation's 40,000 communities with information and tools to increase resilience to climate change," according to an Oct. 6 EPA news release. The Adaption Resource Center (ARC-X) provides users with information designed specifically for their needs, location, and "particular issues of concern to them."

"ARC-X is a powerful new tool that can help local governments continue deliver reliable, cost-effective services even as the climate changes," said former EPA Administrator Gina McCarthy.

## Preparing for the worst-case

Not all climatic events are slowly evolving like droughts and climate change. Some are natural disasters that require plans at the ready. Japan has dealt with a multitude of natural disasters – from flooding from heavy rainfall to earthquakes and tsunamis. Japan's many utilities have learned to prepare and improve their response to these events after decades of trial and error, many of which were detailed during Technical Session No. 520, Insights from Recent Natural Disasters in Japan.

Tomoyuki Inoue of the Japan Institute of

Wastewater Engineering and Technology, detailed how some water resource recovery facilities and pump stations in Japan have systematically modified their structures because of tsunamis. They have prepared for these natural disasters by waterproofing structures against highest tsunami levels. This includes modifying doors, window shutters, and exit hatches; installing barriers against floating objects (cars, for example); and developing evacuation maps that are circulated among facility staff. These evacuation maps even include the location of airlift points.

## Getting public buy-in

Yuki Fujita of the Tokyo Metropolitan Government's Bureau of Sewerage, discussed "Tokyo Amesh," the city's rainfall radar system. The system includes two radars spaced 50 km apart that help alert the public about high rainfall and where major flooding may occur. The radar also enables the city's utility system to use pumping stations more precisely.

Yamato Nakamura of the Sewer Construction Division for the city of Yokohama spoke next. Nakamura shared how the city constructed and spread the word about a temporary toilet system they decided to use instead of traditional toilets due to frequent earthquakes.

Conventional toilets are highly vulnerable to these quakes and are more likely to malfunction, Nakamura explained.

The earthquake-proof toilets are mainly installed in local schools. The public can maintain and operate these toilets themselves. The toilets are built on ground-level, use semi-pure water, can be used for up to 150 days by up to 500 people before they must be emptied, Nakamura said.

Yokohama has constructed the public toilets in 109 locations and may install more.

The public communications campaign for the toilets included drills, educational videos that explain how to set up and use the temporary

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toilets, and signboards with QR codes to show where the toilets are located, Nakamura said.

## The problem with nutrients

Nutrient runoff and subsequent algal blooms in major waterways also must be handled.

During Technical Session No. 324, Leadership in Action: Public Confidence in Utilities, Bill Stowe, CEO and general manager of Des Moines Water Works, said that Iowa has seen a 15% increase in impaired waterways in the past few years. Part of the reason is increased nutrient runoff, something that the wastewater sector is trying to curtail.

“The state has the world’s largest

denitrification facility, which is kind of like bragging ‘I’m the largest chain smoker in the world,’” Stowe said.

He said his utility uses ion exchange to denitrify wastewater but it’s cheaper to remove the nitrogen upstream. This is why Des Moines Water Works took the bold step to curtail runoff by suing point source agricultural polluters.

“In Iowa, discharge from farms is completely unregulated,” he said. “But regulations and public health are closely aligned. I’m glad that when I land at Louis Armstrong [Airport in New Orleans], there are regulations on the pilots and air traffic controllers. ... Regulators serve a purpose.”

## Being prepared and transparent

Water supply contamination seems to be the threat that gets the most media attention. Resilient utilities must have not only a fast responses, but also a methodical one. Technical Session No. 201, Bioterrorism, dealt with these topics.

John Petito, assistant commissioner of the Bureau of Wastewater Treatment at the New York City Department of Environmental Protection (DEP), shared that the agency has had two examples of biocontamination events within the past 20 years – one anthrax scare and the 2014 Ebola outbreak. DEP discovered that “transparency and communication are key elements,” he said.

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Naoko Munakata, a project engineer with the Los Angeles County Sanitation District, said to prepare for similar threats at other facilities, utilities should ask themselves a series of questions, such as:

- What are the transmission risks to workers/public?
- “How do we protect people?”
- How will it affect operations?

Munakata said practical concerns also can affect threat response. Things like how efforts will be coordinated within a utility and with partners, and whether there are regulations or financial issues afoot.

Besides bioterrorism, WEFTEC presenters also explored lead contamination in water. In Technical Session No. 411, Leonard Casson, assistant professor of civil and environmental engineering at University

of Pittsburgh, shared the most recent incidences of lead found in drinking water in the U.S. He cited Washington, D.C. (2001 to 2014), Pittsburgh (2013 to 2015), and Flint, Mich. (2014 to present).

The Flint crisis first came to the attention of William Rhoads, a graduate research assistant at Virginia Polytechnic Institute and State University (Blacksburg), when a mother asked the university to test her home’s water. She asked after children in the household began losing hair and not meeting developmental milestones.

Rhoads found lead levels of 1300 ppb – the highest level allowed by the federal law is 15 ppb, he said.

University researchers continued to collect samples from other Flint households and confirmed similar alarmingly high levels

of lead. In fact, one in five homes in the City of Flint showed lead contamination, Rhoads said.

Utilities have to embrace being honest with their customers, said George Hawkins, general manager of DC Water. Hawkins spoke at the aforementioned Leadership in Action session.

“Being open and transparent is important,” he said. DC Water now publishes an online map that shows a record of services, disclosing where lead service lines are located.

“We’re showing we’re worrying about this with you,” he said. “We’re on your side.”

– **LaShell Stratton-Childers**, WE&T