Grumbles on water

By Benjamin H. Grumbles

Power-Optimizing Treatment Works

Effective energy management practices

Here's a not-so-bold prediction in a world of changing climates: Publicly owned treatment works (POTWs) will become known as power-optimizing treatment works and embrace a "reduce-and-produce" attitude about energy. That would be good and timely news.

Energy consumption by POTWs can account for 30% or more of the total operation and maintenance costs associated with conventional wastewater treatment systems, and POTWs account for approximately 3% of the electricity demand in the U.S. As wastewater flows to POTWs increase and discharge requirements become more stringent, the demand for electricity at POTWs is expected to grow by approximately 20% over the next 15 years.

A first step in managing energy at POTWs is to improve energy efficiency and reduce the volumes of water that require energy-intensive pumping and treatment. Efforts to conserve water and energy through the use of products that are labeled by the U.S. Environmental Protection Agency's (EPA) WaterSense and Energy Star programs can help reduce the volume of water used, wastewater generated, energy used and money spent by households, public facilities and the private sector.

Energy Management

The EPA and others have developed tools to help benchmark POTWs' energy use and track improvements over time in energy conservation. These tools support effective energy management practices such as comprehensive energy audits, effective energy use tracking systems, using energy-efficient equipment and optimizing overall energy use.

POTWs should not stop with reducing water and energy inefficiency; they should evaluate options for energy generation as well. POTWs today are using a range of power generation practices including methane-to-energy projects, onsite solar or wind power and hydroelectric turbines in outfalls. These projects not only reduce energy costs but also generate energy from renewable sources that reduce greenhouse gases.

Onsite power production using biogas generated by anaerobic digestion of sewage sludge offers some exciting opportunities for POTWs to become more energy self-sufficient. The methane from the biogas is used in onsite combined heat and power production to meet building and electrical power demands while:

- Producing power at a cost below retail electricity.
- Displacing purchased fuels for thermal needs.
- Qualifying as a renewable fuel for "biomass-based" electric power generation under green power marketing programs.
- Enhancing power reliability for POTWs.
- Offering an opportunity to reduce greenhouse gas and other air emissions.

A recent report by the EPA's Combined Heat and Power Partnership program titled, "Opportunities for and Benefits of Combined Heat and Power at Wastewater Treatment Facilities," suggests that only 106 of the 544 POTWs (greater than 5 million gal per day) that currently have anaerobic digesters now use their biogas, with the remainder flaring it.

If all 544 of these POTWs were to use the biogas, about 340 megawatts of clean energy could be generated, offsetting 2.3 million metric tons of carbon dioxide emissions annually. This is equivalent to planting about 640,000 acres of forest or eliminating the emissions of about 430,000 cars.

Even higher levels of power production could be realized by using high-efficiency, low-emissions technologies at POTWs, such as lean-burn engines with catalytic converters, microturbines and fuel cells. The biogas produced by POTWs with anaerobic digesters can also potentially be scrubbed to remove sulfur, water vapor, siloxanes, and even CO_2 to produce pipeline-quality natural gas (methane) that can be used as a transportation fuel to help meet new goals for the use of biofuels in the transportation sector.

There are also opportunities to employ natural systems such as constructed wetlands as passive, low-fossil-fuel-use treatment options. Although land intensive, such systems can improve source water quality while restoring degraded wetland habitat. Also, biosolids generated by POTWs can be used to fertilize crops, replacing commercial fertilizer derived from petroleum.

The Road Ahead

Energy efficiency and carbon footprints should play a far more important role in the design of the next generation of wastewater treatment systems. Reducing the carbon footprint of POTWs and making them more energy efficient while still meeting their water quality objectives will require creative new solutions to the challenge of wastewater treatment. The EPA is doing its part to help energy and water operators and policymakers connect the dots, drops and watts. We encourage you to tell us—or even better—show us and your colleagues how to do more. WWD

More information about the WaterSense program is available at www.epa.gov/watersense. To learn more about benchmarking tools available to POTWs, visit www.epa.gov/waterinfrastructure/bettermanagement_energy.html. More about Energy Star can be found at www.energystar.gov. For more about EPA's Combined Heat and Power Partnership, visit www.epa.gov/chip. The CHPP report on opportunities for wastewater treatment plants can be found at www.epa.gov/chp/documents/wwtf_opportunities.pdf.

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