



Lauren Bigelow



Don Jensen



Carol Miller

Clearing the Air

THE WATER UTILITY ENERGY CHALLENGE PUTS FIVE UTILITIES INTO COMPETITION TO REDUCE AIR EMISSIONS THAT COME FROM THEIR USE OF ELECTRICITY

By Steve Lund

Five water utilities in the Great Lakes watershed are engaged in a contest to see how well they can change their operations to reduce the air pollution created by electricity production.

The utilities are taking part in the Water Utility Energy Challenge, a competition funded by the Great Lakes Protection Fund and managed by the American Water Works Association. More than 30 utilities applied to participate, according to Lauren Bigelow, CEO of Growth Capital Network and marketing supervisor for the energy challenge.

The utilities selected were the city of Highland Park, Illinois; the city of Ann Arbor, Michigan; Great Lakes Water Authority, Detroit; Onondaga County Water Authority, North Syracuse, New York; and the city of Bayfield, Wisconsin.

WIDE RANGE OF FINALISTS

The competition began in April 2017 and will cover the succeeding 12 months. The winner, to be announced at the AWWA annual meeting in June 2018, will receive a \$20,000 prize. Second place will be worth \$10,000.

The finalists were selected in part for variety. Bayfield, on the shore of Lake Superior, is tiny, while the Great Lakes Water Authority in Detroit is one of the largest water utilities in the country. Another factor was the kind of records the utilities had before the competition.

“We had to create a baseline, so we needed some historic information,” Bigelow says. “We worked with a number of the utilities to see if they had collected that data. It would be hard to say we had reduced X amount of emissions if we didn’t have any historic data. We’re working with a scientific advisory board. We wanted to ensure results that were pretty unimpeachable.”

TRACKING SOFTWARE

The competitors have access to two software packages developed at Wayne State University with backing by the Great Lakes Protection Fund. The software helps utilities operate more efficiently and provides information about the pollution component in the electricity they use, based on the time of day.

One software package, Polluting Emission Pump Station Optimization, or PEPSO, enables utilities to optimize

DELICATE BALANCE

Most air pollution from power generation comes from coal-fired plants, which generally operate around the clock. So how could changing the time-of-day power usage affect air pollution?

It’s all about the marginal generation — which generator will increase production to satisfy the next increment of demand — says Carol Miller, professor of civil and environmental engineering at Wayne State University in Detroit and a developer of the software being used in the Water Utility Energy Challenge.

Coal plants don’t always run at capacity, so sometimes a coal plant could be the marginal generator. At other times, sources that produce less air pollution are the marginal generators. The air pollution tied to a decision to turn on a pump, for example, could be different at 2 p.m. or at midnight. “The emissions associated with that decision are different at the two times, and it changes each day and changes with location,” Miller says.

Sometimes the least-polluting time to consume electricity is not the least expensive, but software packages can still offer options. “There are times when optimization for least emissions does in fact mean that the cost will go up,” Miller says. “But there are also ways to set the constraints on the system such that the optimization will first search for least cost. Then within the multitude of solutions that satisfy least cost, the one that is most sensitive to emissions will be selected.”

operations for either least amount of electricity consumed or least cost of electricity. The other, called Locational Emissions Estimation Methodology, or LEEM, helps utilities optimize for the least air pollution created by the electricity they use.



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LEEM tracks mercury, carbon dioxide, sulfur dioxide, nitrous oxides, and lead emissions from all the generators sending power to the grid. Each day, utility operators receive reports telling them the emission rates of those pollutants for the next 24 hours. Carol Miller, a Wayne State University professor and a developer of the software, says the generator supplying a particular utility varies throughout the day, so the emissions associated with electricity use at that plant also vary with time.

MAKING ADJUSTMENTS

With LEEM, “I get a daily look-ahead,” says Don Jensen, superintendent of water production for Highland Park. It identifies the optimal times to use electricity based on pollution percentages.

Jensen was surprised by what the report showed. He expected the lower-pollution times would occur at night, when demand is lower and only base load plants would be operating. In his area, many of those plants are nuclear.

“It turns out I was completely wrong,” he says. “The lower polluting periods fall between about 9 a.m. and 10 or 11 p.m. I’m guessing that may be when there are more abundant renewables, such as solar and wind, on the grid.” That means optimizing for reduced pollution will often conflict with minimizing electricity costs, which usually peak in the middle of the day.

“If it costs you more for energy to pump during the daytime when pollution is lower, you have to pick your poison,” Jensen says. The utility has limited storage, so it’s constrained by the need to pump to meet demand.

“Our capabilities to adjust are pretty limited,” he said. “We’re using that look-ahead and trying to shift, if we can, to lower pollution. We have shifted, but it’s subtle; it’s on the margins. We can’t control demand. We have to serve our customers’ needs, although we do encourage conservation.”

SUSTAINING PRESSURE

In Ann Arbor, operators face the same constraint, adjusting to reduce air pollution when they can while keeping water pressure at a certain level, says Lynne Chaimowitz, financial analyst. “We’re working with the parameters of what we need to provide our customers,” she says. “Where there is the ability to make these operational adjustments, we’re doing that.”

The competing utilities have to work out the balance between costs and pollution according to their own needs, Bigelow says. They will be judged on overall emissions reductions, reductions of mercury, percentage of emissions reductions, innovations in the use of the software, and other factors. The utilities provide monthly reports.

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Utilities don’t have to be in the competition to use the software. “PEPSO is downloadable and accessible for utilities across the United States,” Bigelow says. “LEEM data is not available for the entire U.S. yet, but they are working on it.” It’s available for free at www.awwa.org/competition.

Other organizations collaborating on the energy challenge are CDM Smith, E21, Great Lakes and St. Lawrence Cities Initiative, Growth Capital Network and Wayne State University. **tpo**

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