Exploring ENERGY Options
Alternative Sources Can Mean Savings for Utilities

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Faced with increasing water demand, rising treatment costs, and a troubled economy, water and wastewater utilities across the country are turning to alternative energy to operate their plants and bring down the bottom line. By implementing solar panels, wind turbines, fuel cells, and other cost-saving green energy technologies, many utilities are finding ways to keep their costs down while still offering the same services. An added environmental benefit is the reduction of greenhouse gases that contribute to global warming.

Water and wastewater industries account for an estimated 56 billion kilowatt-hours (kWh) of the overall U.S. electricity demand, according to the U.S. Environmental Protection Agency (EPA). It costs approximately $4 billion a year to provide energy for the country’s water systems. And that cost is expected to rise as the population continues to increase and resources become scarcer.

Jason Turgeon, an environmental scientist with the EPA Region 1, reports that three percent of the total energy used in the country is consumed through water and wastewater treatment, and the consumption is split evenly between the two. “That’s a tremendous amount of energy,” he says. “Three percent doesn’t sound like a lot of energy, but it’s roughly equal to the total residential energy demand for the state of California.”

**Costs Are Rising**

Energy is usually one of the top expenses at municipality owned water and wastewater treatment facilities, and consumers end up paying the bill. From 2002 to 2007, U.S. municipal water rates increased an average of 27 percent, according to a report from the Earth Policy Institute.

Approximately 90 percent of drinking water utility costs come from pumping, so Turgeon recommends some low-cost, simple solutions first, like fixing leaks. For wastewater treatment plants, optimization of aeration systems is the most important efficiency tip to implement.

After considering efficiency, alternative or renewable energy options, specifically solar, wind, fuel-cell technology, hydropower with the right topography, and even sludge gasification for wastewater treatment plants can be used as energy. “We feel strongly that wastewater plants have the capacity to make up the majority of their energy with sludge and essentially become net zero on the grid,” says Turgeon. “We’re seeing people getting close to net zero.”

But the necessary startup funds for alternative energy technologies are often cost-prohibitive. “Alternative energy usually involves a lot of capital and takes a long time to recoup that initial expenditure,” Turgeon says. “That’s one of the reasons we point to energy efficiency first. Solar and wind are still relatively expensive. In many instances it can take 17 or more years to recoup your initial investment, so many places won’t even consider it. But it definitely does remove some of the volatility from pricing, and it’s a great way to hedge costs.”

As a result of rising costs, alternative energy sources are being looked at more today, Turgeon says, but efficiency should be the first avenue utilities travel down before initiating alternative energy choices. “It’s boring, and it’s not sexy, but if you’re looking for a sound financial position, your best bet is energy efficiency first,” he says.
Unfortunately, government tax incentives for alternative energy hold no value for municipalities because they don’t pay taxes. A popular trend in alternative energy is third-party power purchase agreements. “A third party erects solar panels, owns, maintains the equipment and forms a long-term contract with a water utility,” Turgeon explains. “It’s a gamble if the price of energy drops; the municipality might lose out. At the end of the contract, the utility usually has the option to buy the solar panels or equipment.”

In most instances, though, customers see a benefit. “The customers will save some money if it’s structured right,” Turgeon says. “If there’s a tremendous energy spike like we just experienced last year, and a third or a quarter of their budget is already energy, it may become the largest thing in the utility’s budget. Then definitely, customers would save money. In the long term, they’re likely to save money, but because it’s a gamble, you can’t say exactly how much. But there are some firms that will guarantee a certain savings. I think it’s an idea whose time has definitely come. In the next few years, we’ll see much more of this happening.”

Third-Party Purchase Agreements

Rifle, Colorado, is one municipality using a third-party energy purchase agreement. Located 180 miles west of Denver, Rifle, population 8,700, uses solar panels to produce electricity to pump water from the Colorado River at the Rifle Pond pump station.

The 600-kW water pumping solar array began operating in September 2008 to provide electricity to the city’s raw water pump station. In 2009, the city also will begin operating a new Rifle Regional Wastewater Reclamation Facility that will be partially run by two groups of solar panels covering 12 acres. When it’s completed, Rifle will have one of the largest municipal photovoltaic solar installations in the country.

Since 2003, Rifle has experienced a natural gas well drilling boom, which has caused a surge of new jobs and demands for housing, ultimately impacting the city’s water and sewer infrastructure. Previously, the city was served with two aerated lagoon systems; however, soon the $23.2 million new wastewater reclamation facility, funded through the clean water state revolving loan program, will accommodate the city’s growing population.
Rifle is also among the first in the state to take advantage of Colorado’s Renewable Energy Production Incentive statute that allows for financial incentive payments for electricity produced and sold by new qualifying renewable energy generation facilities. Qualifying facilities are eligible for annual incentive payments of 1.5 cents per kWh for the first 10-year period of their operation. Under the plan, qualifying facilities may use solar, wind, geothermal, biomass, landfill gas, livestock methane, and ocean generation technologies.

Charlie Stevens, Rifle’s utilities director, says the city developed an opportunity analysis a few years ago as part of an energy village concept. Through a power purchase agreement with SunEdison, the city of Rifle utilities will use the power generated by the two solar arrays to provide 90 percent of the needed power to operate the city’s water intake pumps and approximately 60 percent of the power needed to operate the city’s new wastewater facility. The best part is that there is no cost to rate payers for the construction of the solar energy systems.

In the meantime, the utilities will use a portion of the produced power now, and the rest will go back to the grid until the wastewater facility is fully operational. Stevens explains that SunEdison will get tax credits from the federal government and tax incentives and rebates through the state. He adds that the rising cost of running the plant prompted the municipality to take advantage of the program now. Stevens estimates that when fully operational, the utility’s energy costs may be cut in half by the technology but says it’s difficult to project what savings may be passed on to customers, if any.

“We entered into a 20-year agreement with a third-party provider,” Stevens says. “Everything was put in by SunEdison. All we have to do is buy the power at a reduced cost. Over a 20-year period of time, I think it could be a significant savings. It depends on how much the price of electricity rises.”

In addition to the financial advantage, there is an environmental one. Both systems will pump out 2.3 megawatts of clean electricity. The two systems will prevent more than 152 million pounds of carbon dioxide that would have been emitted through the production of the needed electricity through fossil fuels over the 20-year period.

Although Rifle is one of the first in the state to take advantage of the Renewable Energy Production statute savings, Stevens believes more will be following soon. “Once they see how it’s going to work and people become more confident in it, I think there will be more and more,” he says.

In larger cities, some utilities are purchasing green energy outright from providers to help run their plants. One of the largest such purchase agreements for wind energy in the country is the Washington Suburban Sanitary Commission that serves Maryland. It has a 10-year contract importing electricity from wind turbines in Stoystown, Pennsylvania, to provide a third of its energy needs for water and wastewater treatment in Prince George’s and Montgomery counties. EPA has placed it in the top five among all local government groups in the country for green power use.

Financial Assistance for Renewable Energy

Third-party purchase agreements are not the only way a municipality can offset the upfront capital costs of renewable energy. Many states are offering grants directly to utilities to implement alternative energy costs. Congress and several state legislatures are considering and, in some cases, adopting bills that offer grants and rebates for green energy.

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Lometa, Texas, is a small town of approximately 2,000 people, 85 miles northwest of Austin. The town’s wastewater facility recently was awarded a $488,714 grant through the state Office of Rural Community Affairs to install solar panels to help power its wastewater treatment plant.

The project, expected to be completed by fall 2010, will consist of a 50-kWh photovoltaic (PV) system. The total project cost is estimated at $540,452 with the Lower Colorado River Authority (LCRA), the wastewater provider for this community, providing the remaining $51,738 through in-kind services to design and construct the facility that will house the solar panels.

Sherri Kuhl, manager of water stewardship at LCRA, estimates, “that the solar PV system will generate approximately 70,000 kilowatt hours per year or half the wastewater treatment plant’s current energy needs. At today’s electric rate, this will reduce the plant’s current energy bill by $6,000 to $10,000 per year or about 50 percent of the annual utility costs. This will serve to help manage the costs of providing consistent, reliable wastewater service for the people of Lometa.”

According to Kuhl, Lometa was a good candidate for the solar panels for the following reasons:

- There is ample vacant land within the existing treatment plant confines;
- The terrain is mostly flat and free of trees or other vegetation that would shade the panels from the sun; and
- The area has a generally arid climate, meaning that there are relatively few days when the sun is not shining.

Although the drinking water system is in another part of town and won’t benefit from the new solar panels, it has been using a solar-powered water circulator to help remove a blue-green algae smell and taste from the water source since 2005.

Called SolarBee, the circulator moves more than 10,000 gallons of water per hour breaking the water surface where a layer of nutrients feed the algae. In addition to the energy savings on the solar-powered circulator, the town has reaped environmental benefits by treating the algae problem without chemicals.

Massachusetts also offers a funding mechanism to utilities promoting green energy called the Massachusetts Renewable Energy Trust (MRET). Charlemont, a small hamlet located in northwestern Massachusetts with a population of approximately 1,300 residents, has purchased a solar array thanks to the state-run program.

The municipal wastewater treatment plant in Charlemont installed a 15 kWh photovoltaic solar array in May 2005 that has reduced its energy costs by 54 percent. The project includes 96 solar panels mounted on eight poles connected to three inverters. The plant used a grant from the MRET to offset half of the $142,000 cost of the project.

Originally, Charlemont’s payback time for the startup capital was 17 years, says Plant Manager and Chief Operator Dawn Peters, but due to higher energy costs, that has decreased. “Every time rates go up, it gets shorter,” she says. “It’s a win-win for us. A long-term investment will keep on paying you back for a long time. People are always thinking in the short term instead of about long-term, permanent returns.”

Turgeon calls the Charlemont project “one of the standouts. They had a relatively simple process … got approval from the board. They are running more than half of the plant on solar energy now.”

Prior to the installation, the plant’s average energy use in the month of June was 2,482 kWh. Since installation, the average June usage has dropped to only 950 kWh, a 62 percent reduction. Use of the solar panels also reduced the facility’s carbon dioxide output by nearly 17 tons in the first two years of operation.

“I am a strong advocate of solar power,” says Peters, who had the idea to bring alternative energy to Charlemont. “And here, as is the case with most water and wastewater treatment plants, there is no shade, just lots of sun. I kept looking at that and thinking..."
this is ridiculous. Why are we wasting that resource? I talked to the commissioners and asked if they were interested in having some people I know who install PV systems, and they were.

“I’m very fortunate in having some very forward-thinking bosses,” Peters continues. “They’re looking at it as a long-term investment, and it is. I had one person come up to me and say, we put everybody else to shame. My commissioners expected to get complaints from people in the district, but instead they got praise.”

Massachusetts Pilot Program

In December 2007, a Massachusetts pilot program conducted an energy audit of seven drinking water and seven wastewater plants in the state to provide free energy audits and outline alternative energy sources for them. The program, sponsored by the Massachusetts Department of Environmental Protection and state Executive Office of Energy and Environmental Affairs, was initiated to reduce the amount of energy and decrease greenhouse gases from municipal drinking water and wastewater facilities.

Mike DiBara, project manager, says, “Basically, we guided them from assessment of current energy performance to implementation of energy savings and renewable projects. We came up with over $2.7 million of potential annual energy savings and over 18 million kilowatt hours.” Several green energy recommendations were made for both drinking water and wastewater facilities, including implementations of wind, solar, biomass, and hydroelectricity.

DiBara reports that the pilot is looking into what types of financial system programs are available for implementation. He cites a hydroelectricity drinking water project for the city of Worcester that has reached the feasibility study stage. “The water filtration plant is performing a feasibility study to look at installing a 25 kW hydroelectric turbine to transfer six million gallons of water between reservoirs per day with a generation capacity that far exceeds that of solar and wind,” DiBara says.

“Today, there’s an opportunity for drinking water and wastewater utilities to save money and reduce greenhouse gas production,” he continues. “First and foremost, they can save money, but as an added incentive, they can do the right thing for the environment. From an economic and environmental standpoint, it simply makes sense.”

More Information

To learn more about alternative energy and water systems, visit EPA’s Water Infrastructure Web site at [www.epa.gov/waterinfrastructure/bettermanagement_energy.html](http://www.epa.gov/waterinfrastructure/bettermanagement_energy.html).


Several Web sites related to energy and water may be found on pages 12-13 of this On Tap.

References


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