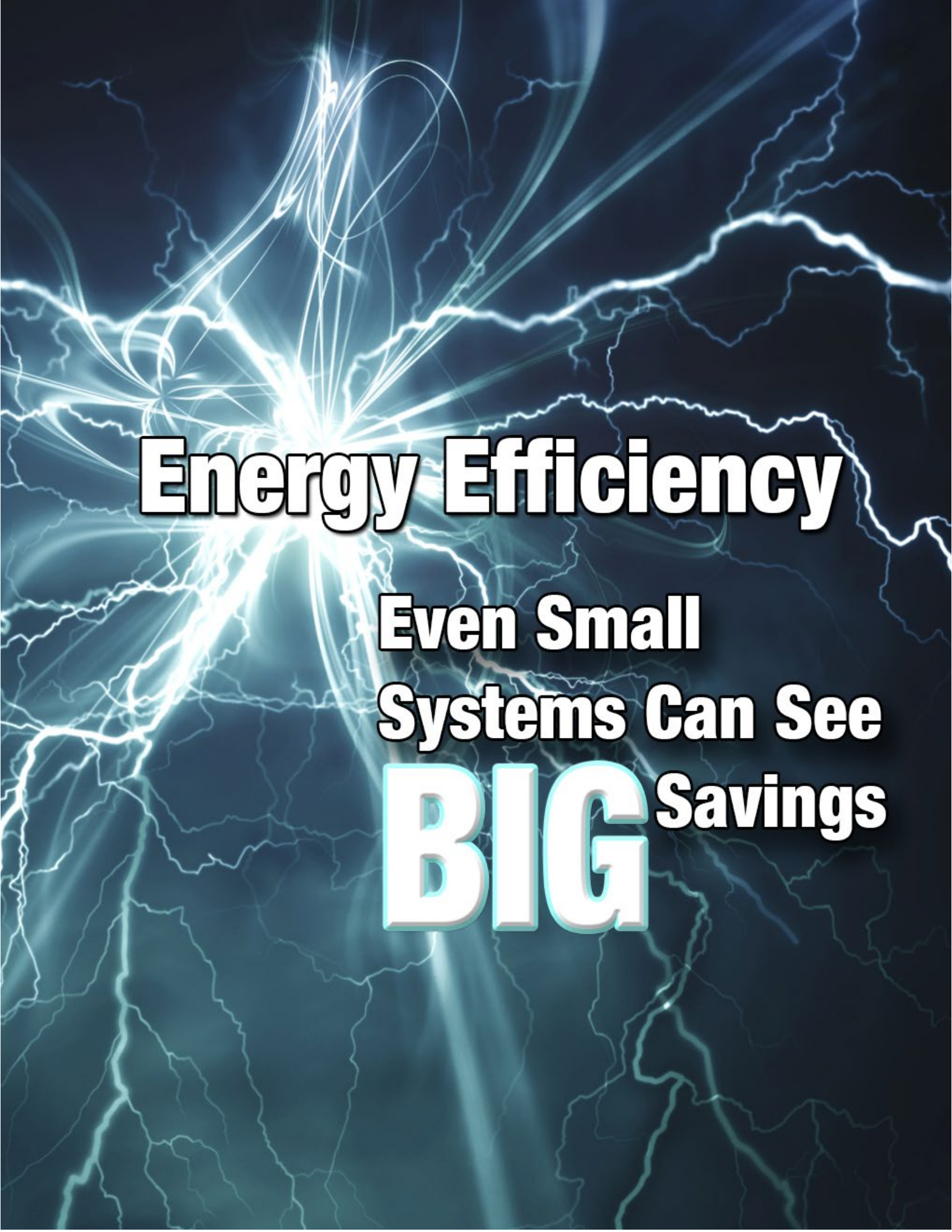

Energy Efficiency
Even Small
Systems Can See
BIG Savings

Water and energy have a close relationship: energy production requires water, and water treatment, distribution, and wastewater treatment, require energy. Water and energy are also increasingly stressed, as demand for both increases.

Currently, drinking water and wastewater systems use an estimated 56 billion kilowatt hours or about three percent of the nation's total energy consumption. Water and wastewater facilities are considered energy intensive operations, accounting for more than one-third of municipal energy use, according to the U.S. Environmental Protection Agency (EPA). In the years ahead, both EPA and the U.S. Department of Energy (DOE) expect water and energy use will continue to climb, stretching both resources even further.

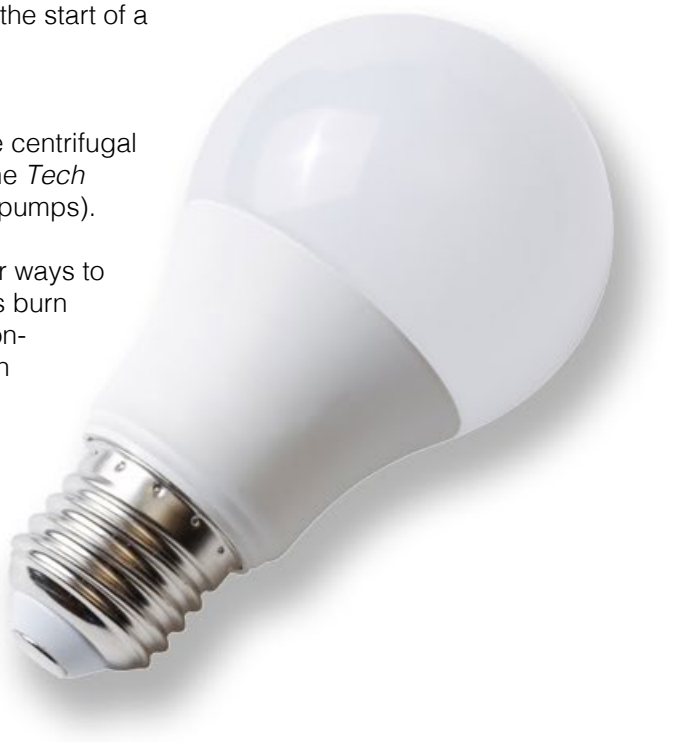
It makes good sense, then, for drinking water and wastewater utilities to be more efficient in their operations. This efficiency has the added benefit of saving money—often considerable money.

Where to Begin

"The biggest energy users in a water or wastewater facility are the pumps," says Zane Satterfield, P.E., an engineering scientist with the National Environmental Services Center (NESC). "They are the workhorses of any drinking water distribution or wastewater system. They often operate 24 hours a day, 365 days a year getting water to homes and business, and removing wastewater from them." A correctly sized pump will work efficiently for many years, saving a system money and energy. An incorrectly sized pump can fail if it's too small or result in unnecessary expense if it's too big.

"Spending some time with your pumps and related issues can pay big dividends," Satterfield says. Specifically, he recommends:

- If possible, pump water during your electric utility's off-peak times. This is often in the middle of the night, which works well for drinking water storage so that a supply is ready for the start of a new day.
- Use variable frequency drive motors.
- Use variable speed motors.
- Check pumps for wear and correct size. Review the centrifugal pump curves to assure maximum efficiency (see the *Tech Briefs* mentioned below for more information about pumps).



While pumps are the biggest energy users, there are other ways to save. Lighting is one place. It's a good idea, as light bulbs burn out, to replace conventional bulbs with LED lighting. Motion-sensitive lighting is useful to make sure that lights aren't on when no one is in a room or building.

Be sure that treatment facilities are kept at an appropriate temperature and the buildings are well insulated. Electric heaters can use a great deal of energy in uninsulated rooms full of water-cooled pipes.

Finally, encouraging water conservation means less water and wastewater treated, saving money. The

distribution system should be leak-free (less than 10 percent unaccounted-for water). The American Society of Civil Engineers estimates that more than six billion gallons of treated water is lost every day to leaks. Customers should be strongly encouraged to install low-flow fixtures and other conservation tips should be vigorously promoted.

A Water Audit May Be Useful

A good way to identify potential energy savings is to have an energy audit. To assess energy efficiency, an auditor—usually an industrial engineer—will tour the facility with the operator, observing lighting, HVAC systems, pumps, and operational processes within the utility.

An energy audit of a small wastewater system that wishes to remain anonymous, yielded some interesting suggestions. Some require more up-front investment than others, but nearly all would result in savings over a time period of several months (not years). Here are some specific suggestions from the audit, including the estimated annual savings and simple payback time.

Descripttion	Estimated Cost	Annual Savings	Sample Payback
Use dissolved oxygen sensor for automatic operation of blowers	$3,800	$12,327	4 months
Replace existing coarse diffusers to fine pore diffusers on blower system	$2,535	$11,207	3 months
Perform vibration analysis on equipment	$1,000	$4,573	3 months
Use UV disinfection instead of chlorine	$6,000	$4,146	18 months
Implement motor management system	$ 594	$2,832	3 months
Replace aging equipment with energy-efficient models	n/a	$41,343	n/a
Replace existing T12 lighting bulbs with T8 bulbs with reflectors and electronic ballasts	$3,162	$1,396	28 months
	$17,091	**$77,824**	

In the case of this 3,000-customer utility, an investment of $17,000 would yield annual savings of $77,000 with a payback period of less than two years. Additionally, these suggestions would result in an electricity reduction of 780,000 kWh and would reduce C02 emissions by more than 1.7 million pounds.

"You don't have to get perfect all at once. Take a look at your operations and decide which items you could do now, and which are more of a 'wish list' for down the road."

— Zane Satterfield P.E., Engineering Scientist National Environmental Services Center (NESC)

Where to Go From Here

Of course, some water utilities have taken things even farther, using solar panels and wind turbines to generate electricity, or using alternative fuel vehicles to cut costs. For utilities able to make energy-saving investments, the results will reveal themselves quickly.

"You don't have to get perfect all at once," observes Satterfield. "Take a look at your operations and decide which items you could do now, and which are more of a 'wish list' for down the road."

Energy Saving Tips

1. **If possible, perform operations during off-peak hours when energy costs are lower.**
2. **Use variable-speed drives on large throttled motors.**
3. **Make sure the distribution system is leak-free.**
4. **Promote the use of water-conserving plumbing fixtures.**
5. **Replace inefficient and improperly sized equipment.**
6. **Make sure pumps are properly adjusted.**
7. **Trim or replace impellers.**
8. **Keep buildings insulated.**
9. **Install automatic lighting so that lights do not remain on when no one is present.**
10. **Use LED lighting wherever possible.**

Sources; New York State Energy Research and Development Authority, Demand Management Institute, and National Environmental Services Center.

More Information

The National Environmental Services Center (NESC) has published several articles relate to energy and savings.

- "Water and Energy: An Uncertain Future, A Monumental Challenge" www.nesc.wvu.edu/pdf/dw/publications/ontap/magazine/OT_WI09.pdf
- "Energy Audits May Offer Cost Savings to Utilities" www.nesc.wvu.edu/ndwc/articles/OT/SP07/OT_SP_07_Audits.pdf
- "Exploring Energy Options: Alternative Sources Can Mean Savings for Utilities" (p.16) and "A Dollar Saved is a Dollar Earned," (p. 20) are available at: www.nesc.wvu.edu/pdf/dw/publications/ontap/magazine/OT_SP09.pdf

NESC's *Tech Briefs* have covered several topics related to pumps.

- "Pumps" www.nesc.wvu.edu/pdf/dw/publications/ontap/2009_tb/pumps_DWFSOM56.pdf
- "Calibrating Liquid Feed Pumps"
- www.nesc.wvu.edu/pdf/dw/publications/ontap/2009_tb/calibrating_pumps_dwfsom105.pdf
- "Reading Centrifugal Pump Curves" www.nesc.wvu.edu/pdf/dw/publications/ontap/tech_brief/tb55_pumpcurves.pdf

The Electric Power Research Institute's website has more information about energy efficiency. Learn more at: www.epri.com/Pages/Default.aspx

The U.S. Environmental Protection Agency maintains a site related to energy use in drinking water and wastewater utilities at http://water.epa.gov/infrastructure/sustain/energyefficiency.cfm

National Environmental Services Center
NESC Assistance. Solutions. Knowledge.

"The National Environmental Services Center is a federally funded program that provides free and low-cost information; a comprehensive website; technical assistance via toll-free telephone; magazines and newsletters; training; and educational products specifically designed to address drinking water and wastewater issues of concern to small and rural communities."
***Website**: http://www.nesc.wvu.edu*
***Phone:** 800-624-8301*