By Stewart Kasper, KRWA Technical Assistant

Conserving Energy, Reducing Costs

The fundamental art of any business is to bring in more money than the business spends. Please make no mistake about it – water and wastewater systems are a business. Unlike the conventional business, where the customers have many different choices, they have little to no choice of where they get their water and wastewater services. The question is, if your customers had a choice of where they get their services, would they pick your water system? Are we doing everything we can to keep the money going out the door low as possible? One of the most significant water and wastewater system expenses is electricity. However, it is often thought of as a necessary evil. We have to pump or produce water, so why worry about what we cannot control? No electricity indeed means the pumps do not spin, tanks don't fill, and eventually, faucets don't flow. Conserving electricity in a water or wastewater plant is a broad umbrella, one which entire books have been written on, far too large for a magazine article, not to mention this mere operator pretending to author. So, we must start somewhere – so let's start simple.

Let's review something that is in every single plant I've ever been in – it's the lighting. Everyone knows that switching from the older incandescent light bulbs to the more efficient LED bulbs can save money. How much is often surprising. Suppose you would indulge me for a moment. Walk through whatever building you're in while reading this. Count every light bulb you see and note what type they are: incandescent bulbs or fluorescent. If it's too large, pick a small section of the building. If there are incandescent lights in the building, please review the table below.

For this example, let's use the most common lightbulb, a 60-watt incandescent bulb compared. A 60-watt lightbulb has a light output of 800 lumens; the LED equivalent to that is a 13-watt LED. Many water plants are operating 24/7. However, let's compare the two bulbs in a standard 8-hour shift or 2,920 hours per year. The 60w bulb will use an estimated 175.2 kWh of electricity, while the LED bulb would only use 37.96 kWh. An average national electrical rate is around $0.12/kWh. Based on that, if 175.2 kWh of electricity is used in one year, the cost would be $21.02 in electrical costs for the one bulb. Conversely, if you replaced that incandescent bulb with an LED equivalent, the cost would be only $4.56 to light that bulb eight hours a day for an entire year.

The electric usage isn't the only factor, though. As LED technology has improved, the cost of bulbs has decreased. I pulled the prices from a local big box store's website and found that the cheapest 60-watt incandescent bulb runs $1.09/bulb while the most inexpensive LED equivalent costs $1.35/bulb. For only $0.26, a person could expect to receive 25 times the life expectancy from that bulb. In a year, one could expect to replace an incandescent bulb three times at the cost of $3.18. Given that the bulb will provide service into the following year, we prorate the price of the bulb while only needing one LED bulb to last 8.5 years. In summary, by changing that one bulb to an LED, an operator can save the utility $19.50/year. That may not seem like a huge savings at first glance but it is significant as there are many lights in water treatment plants.

When comparing fluorescent light bulbs to LED bulbs, on average, an LED bulb will save approximately 75 percent on energy. The main reason for this is the need for consistent and controlled delivery of electricity; fluorescent bulbs require a ballast. The older fluorescent lamps use a magnetic ballast to start and run the lamp. The magnetic ballasts use electricity, even before sending electricity to the bulbs. When fluorescent bulbs begin to flicker or eventually burn out, the ballast is still sending the bulb electricity, and even when the cathode isn't creating light, it is still using electricity without the benefit of the light. By converting to ballast-free LED bulbs, we see significant savings just in getting rid of the energy-consuming ballast and making the light quieter as the ballast will eventually start making a buzzing noise.

Everyone knows that switching from the older incandescent light bulbs to the more efficient LED bulbs can save money. How much is often surprising.

When operating incandescent bulbs or fluorescent bulbs, a lot of electricity is being spent just to heat the bulbs. This is wasted energy in the bulb and will cause increased electrical usage within the cooling system of the building.

Type	Bulbs	Watt	Hrs	Hrs/Yr	Watts	kWH	$/kWh	$/Yr.	Life	$/Bulb	$/Yr	Total $
60W	1	60	8	2920	175200	175.2	0.12	$ 21.02	1000	1.09	$3.18	$ 24.21
LED	1	13	8	2920	37960	37.96	0.12	$ 4.56	25000	1.35	$0.16	$ 4.71

Energy Assessment Program Overview

The Kansas Rural Water Association (KRWA) implemented a program in July 2019 to assist water and wastewater utility systems with evaluation and reducing their energy consumption costs. The energy efficiency assessment evaluates current, and past energy use, classifies primary energy consuming components and identifies methods to reduce energy use and costs. The program is funded through a contract administered by the National Rural Water Association with funding as a benefit of USDA Rural Development.

The concept of the Energy Assessment is to outline energy efficiency projects or operational changes and identify potential electrical savings. The electrical savings might be utilized to pay for improvements over a period of years, outlined as "payback years".

Another aspect of the Kansas Rural Water Association Energy Assessment is to point out any electrical safety issues which could result in serious injury

As of December 31, 2021, KRWA has completed 42 assessments. The most recent complete assessment for a rural water district in eastern Kansas showed these results:

- The estimated annual electrical usage for the district is 454,110 kWh. The estimated annual electrical cost is $52,732.
- The estimated energy savings for the district is 92,885 kWh to 162,907 kWh. This would equate to an annual electrical cost savings of $10,660 to a holistic savings of $18,723.

The Energy Assessment Program approach focuses on implementing primarily fast-payback measures. At the same time, a Holistic Approach would also encompass upgrading aging equipment, locating and repairing line leaks, and other more capital-intense upgrades. Combined with energy savings and construction costs, the suggested improvements are projected at $93,000 to $242,000. The simple payback ranges from 6.6 years to 10.2 years with the energy savings.

The impact of this assessment project would result in an annual reduction of 65.8 to 115 metric tons of greenhouse gasses. This equals a yearly reduction of greenhouse gas emissions of 14.3 to 25.1 cars and CO2 emission reductions from the electricity of 12 to 21 homes.

Wattage comparison to the amount of light output

EFFICIENCY	LEAST			MOST
BULB TYPE	STANDARD	HALOGEN	CFL	LED
450 LUMENS	40W	29W	9W	6W
800 LUMENS	60W	42W	14W	9W
1100 LUMENS	75W	53W	18W	11W
1600 LUMENS	100W	72W	23W	14W
RATED LIFE	1 YEAR	1-3 YEARS	6-10 YEARS	12-25 YEARS
SAVINGS	X	UP TO 30%	UP TO 75%	UP TO 90%

If you would like more information on potential energy savings at your city or RWD, KRWA would be happy to provide your system with a complete energy assessment. Thanks to a contract funded by USDA Rural Development and administered through the National Rural Water Association, KRWA can provide this service to water and wastewater systems at no cost. KRWA has partnered with Energy Solutions Professionals of Overland Park, Kansas to conduct the assessments. Lighting is a very small part of the electrical usage at a water and wastewater system. Utilizing a holistic approach to energy conservation, we are sure to save any water or wastewater system money on their utility bills.

Attend the conference

I encourage everyone to attend the upcoming Annual Conference & Exhibition, March 29 – 31 at the Century II Convention Center. And I particularly want to draw attention to the training sessions. I hope you will mark "Funding System Upgrades By Saving On Utilities" at 2:45 p.m. on Wednesday, March 30. Jeff Flathman, President of Energy Solutions Professionals, will explain the energy assessment program and show how to guarantee to pay for system improvements with the energy savings. This company and more than 200 other providers of products and services look forward to meeting you in EXPO Hall. There's no better place to shop and learn.

Stewart Kasper joined KRWA staff in August 2020 as Technical Assistant/Trainer. He holds a Class IV operator certification for water and Class IV operator certification for wastewater in Kansas. Prior to joining KRWA, he was water plant operator at Rural Water District No. 2, Miami County.