Taking Control of Your Electric Bills

by Greg Baker, Efficiency Vermont

Many facility operators assume that energy costs are a fixed budget item, like salaries or rent, which will always increase. But numerous operators in Vermont are finding that they’re able to maintain or reduce energy costs by becoming familiar with their facility’s electric bills and monitoring them regularly.

This enables facility managers to take steps to establish budgets for electric costs and to adjust their facilities’ energy use to reduce costs. They are then better able to plan for cost-saving investments in energy-efficiency upgrades, which can further build budget capacity.

To take control of your facility’s electric costs, start by getting a copy of your electric bill. Your electric costs are determined by:

- Electric rate
- Energy use
- Amount of energy used during peak hours (when rates are higher)

Typically, peak hours are 6am-10pm, Monday-Friday. Check with your electric utility to be sure.

If your bill reveals high energy use during peak hours, it may be cost-effective for you to shift some electric demand to off-peak times. The chart illustrates the impact on an electric bill for a sample wastewater facility by shifting 10kW of peak demand to an off-peak billing period, which can result in significant savings.

Depending on your electric utility and the amount of energy you consume, your bill will include one or more of the following types of charges:

**Demand Charge.** A demand charge, measured in kilowatts (kW), reflects the maximum power used during a 15- or 30-minute interval for the billing cycle. You may have demand charges for peak hours only or for both peak and off-peak hours. Demand for peak-hour electricity can be significantly higher than off-peak rates.

**Energy Charge.** Energy charges, based on kilowatt hours (kWh) consumption, can also have different billing

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Saving Money at the Cabot WWTF

by Wayne Graham, VRWA

The Cabot Wastewater Facility is a state of the art membrane filtration/activated sludge process, operated under contract by Earth Tech personnel. The facility was built in 2001 in order to end years of direct discharges and to meet strict discharge limitations, including phosphorous removal.

Four pump stations deliver 30,000 gallons of raw sewage daily to the facility. The raw sewage enters six 10,000 gallon septic tanks for primary settling and filtering. The wastewater then enters two equalization tanks where it is aerated and then flows into the biological portion of the facility, called the aerobic zone tanks.

In the aerobic zone, sodium aluminate is added for phosphorous removal. The phosphorous forms a precipitate that is trapped in the sludge and later removed. The aerobic zone receives both the plant influent and recirculation flows from the membrane chamber, creating an oxygen-rich area for biochemical oxygen demand removal and for the nitrification process.

This process creates “mixed liquor,” a combination of sludge and microorganisms that completes the biological reactions needed for secondary treatment.

At this point, clean effluent needs to be separated from the mixed liquor. In Cabot’s facility, membrane filtration is used instead of a more typical clarifier. A vacuum is created which draws clear liquid through the small pore size membranes. Sludge is unable to pass through.

Continued on page 4.
Who We Are

Since 1982, Vermont Rural Water Association has supported water and wastewater systems across the state. We provide many services, including training, source water protection planning, and onsite assistance.

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- Elizabeth Walker, Water Systems Specialist
  Ext. 321, ewalker@vtruralwater.org

VRWA Staff


Letters

We want to thank your organization for sending Eric Hanson to assist us with our source protection plan. He was extremely helpful and well informed regarding the formation of our plan.

Without Eric’s assistance and knowledge, we would not be able to prepare such a document. Again, thank you.

Sincerely,
John Williams
President, Newmont Slate Co., West Pawlet

Cold Brook Fire District #1 would like to express its great appreciation for the help recently received from Erik Peterson. He helped us locate a water main line at our ski area for Haystack Mountain construction considerations.

We hope you continue to offer these very useful services. Thank you.

Sincerely,
Roberta Carey
Administrative Assistant, Cold Brook Fire District #1, Wilmington

Publication Staff

Sarah MacMillan, Melissa Green.

News Leaks is the official publication of VRWA. It is published quarterly for distribution to operators, owners, managers and board members of water and wastewater systems in Vermont, as well as to association members, water and wastewater service providers, regulators, and other friends. Opinions expressed in the newsletter do not necessarily reflect the views and policies of VRWA.

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Blais Retires as VRWA & NRWA Director

by Shaun Fielder, VRWA

At the National Rural Water Association (NRWA) Conference in Dallas, Texas this past September, Gilles Blais was honored for his many years of service to Rural Water. Gilles served as a Vermont Rural Water Association (and formerly Northeast Rural Water Association) Director from the association’s inception in 1982. He retired from the position this September.

Gilles has been through a number of up and downs with our association and always strove to see that our mission was met. He has volunteered thousands of hours of service and his dedication is unmatched.

Gilles has been involved with the water industry since 1941. He first worked under his father, Antonio Blais, as a laborer assisting with the reconstruction of eight miles of water transmission line running from Holland Pond in Holland to Derby Line, Vermont. This was no easy task, as this was prior to the days of the modern excavator.

This transmission line carried source water for the International Water Company, which serves Derby Line, as well as Stanstead and Rock Island, Quebec. Gilles’ father served as the Superintendent of this water system from 1960 to 1973. Upon Antonio’s retirement, Gilles served as Superintendent from 1973 to 1995. During those years and up to the present, he has been actively involved with our association.

One would think Gilles would take a break and enjoy retirement, but he plans to put his many years of experience with water systems and board leadership to good use. He plans on starting up discussions with water system representatives and elected officials in Quebec to promote the concept of a Rural Water Association approach for the north side of the border.

Given the unfortunate results of the Walkerton, Ontario water disease outbreak in recent years, Canada is shifting from a “recommended” set of procedures to supply potable water to legal requirements. There will be a growing need for technical assistance in Canada just as there is here in the States.

I was lucky enough to attend the incoming President’s reception at the NRWA Conference with Gilles. Many of the employees of NRWA and Directors from many of the other state Rural Water Associations were present. It was very evident that Gilles had established quite a network of friends. Many of these individuals approached Gilles and commented on the value of his objective and sound professional approach. They truly appreciated their interactions with him over the years, as have all of us at VRWA.

We wish Gilles the best on his future endeavors and thank him again for his many years of service to our industry.

With the retirement of Gilles Blais, the Board of Directors has appointed Jeff Vance of the South Georgia Fire District to fill the open board position until our next membership election.

Training Program Expands

VRWA is pleased to welcome Philip Acebo, our new Training Specialist, who started on October 30. Phil will coordinate training for water operators across the state. He has extensive training experience and will be further expanding VRWA’s offerings.

Philip has taught both middle and high school in Barre for many years. For the past eleven years, he has also served as the Chair of Deep Rock Fire District #8 in Barre Town. Welcome, Phil!

Philip Acebo.
rates for peak and off-peak hours of use. Like demand charges, energy charges can also be significantly higher in peak hours.

**Power Factor Penalty Fees.** If your facility has large numbers of inductive motors, or other equipment that creates magnetic fields, the quality of electricity in your facility may become degraded. If your power factor (highest quality power is represented by 100) drops below utility-specified minimum levels, you may be charged penalty fees.

**Ratchet Charge.** If your utility uses a ratchet charge, your demand charges will be determined by the maximum demand for the billing month or a percentage of the maximum demand from the preceding 11 months. In this way, a high demand for one month may continue to cost your facility money for an entire year.

Once you understand your facility’s electric usage, there are many ways to manage and reduce your energy costs. You can download information about cost-effective energy-efficiency improvements to aeration, pumping, automated controls, solids dewatering, motors and leak detection. Go to www.efficiencyvermont.com, search for “wastewater” and click on “Wastewater Treatment.” Or you can learn about specific energy-saving approaches for your facility by calling Efficiency Vermont, toll-free, at 888-921-5990.

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### Successful Start for Security Pilot Program

by Heather C. Young, Water System Security Coordinator, Vermont Water Supply Division

The Water Supply Division and VRWA recently completed the initial phase of the Very Small System Security Recognition Pilot Program. Vermont and Texas were the only states to participate in this pilot program, which was initiated by the Association of State Drinking Water Administrators (ASDWA).

The program targeted non-transient non-community and community systems serving fewer than 3,300 people. Special attention is being brought to these systems because EPA has required them to complete neither a vulnerability assessment nor an emergency response plan. In addition, many of these very small systems serve schools, nursing homes, and other susceptible populations.

As part of the program, water systems received a site visit, during which the operator was asked a series of questions about existing security equipment and emergency response planning. The visit usually included a walk-through of the system, which highlighted critical components. Participation incentives for this pilot program included onsite assistance, one credit towards operator certification, and a certificate of recognition.

Although the pilot area initially encompassed only Chittenden and Washington Counties, it quickly expanded statewide. Both VRWA and WSD found it advantageous to combine regular onsite visits with conducting the security pilot program survey. Elizabeth Walker typically combined Drinking Water State Revolving Fund (DWSRF) related site visits with the security questionnaire. Heather Young accompanied sanitary surveyors, in addition to making site visits specifically for the pilot program. Shaun Fielder and Paula Jackson also provided program assistance.

A total of 96 systems participated in the pilot program. The Water Supply Division is in the process of preparing follow-up letters, which will encourage systems to do a vulnerability assessment and/or emergency response plan. This letter will include recommendations on how to enhance system security, such as signage, padlocks, and fences.

The Water Supply Division anticipates that the Very Small System Security Recognition Pilot Program will be a bright start to a renewed commitment to water system security and emergency preparedness. Special thanks to VRWA for assisting in this worthwhile effort!

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### Security Recognition Pilot Program Goals

1. Assist and encourage systems to consider security improvements.
2. Inspire systems to do a vulnerability assessment and/or emergency response plan.
3. Recognize systems that have been proactive about enhancing system security.

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**Energy Efficiency Fact:** Typically more than 55% of a wastewater plant's energy use is for aeration.
When discussing underground pipelines, a “stray current” is any direct current that flows through the earth from a source not related to the pipeline. When these stray direct currents accumulate on a metallic pipeline or structure, they can cause corrosion of the metal or alloy. Sources of stray current include cathodic protection systems, trains or street cars powered by direct current, arc-welding equipment, direct current transmission systems, and electrical grounding systems.

To cause corrosion, stray currents must flow onto the pipeline in one area, travel along the pipeline to some other area or areas where they then leave the pipe (with resulting corrosion) and reenter the earth to complete the circuit. The amount of metal lost from corrosion is directly proportional to the amount of current discharged from the affected pipeline.

Fortunately, in most cases, corrosion currents on pipelines are only thousandths of an ampere (milliamps). With galvanic corrosion, current discharge is distributed over wide areas, dramatically decreasing the localized rate of corrosion. Stray current corrosion, on the other hand, is restricted to a few small points of discharge, and, in some cases, penetration can occur in a relatively short time.

Considering the amount of buried iron pipe in service in the United States, stray current corrosion problems for electrically discontinuous gray iron and ductile iron pipe are very infrequent. When it happens, however, there are two main techniques for controlling stray current electrolysis on underground pipelines: 1) insulate or shield the pipeline from the source; or 2) drain the collected current by either electrically bonding the pipeline to the negative side of the stray current source or installing grounding cells.

Ductile iron pipe is manufactured in nominal 18- and 20-foot lengths and employs a rubber-gasketed jointing system. These rubber-gasketed joints offer electrical resistance that can vary from a fraction of an ohm to several ohms; this resistance is sufficient to make ductile iron pipelines electrically discontinuous.

A ductile iron pipeline thus comprises 18 to 20-foot-long conductors that are electrically independent of each other. Because the joints are electrically discontinuous, the pipeline exhibits increased longitudinal resistance and does not readily attract stray direct current.

Investigation of the Pipeline Route

It is important to inspect the pipeline route during the design phase for possible stray current sources. If problems are suspected, mitigation measures can be designed into the system or the pipeline can be rerouted. If the inspection reveals an impressed current cathodic protection rectified anode bed in the general vicinity of the proposed pipeline, one method of predicting potential stray current problems is to measure the potential difference in the soil along the proposed pipeline route in the area of the anode bed.

The installation of a ductile iron pipeline typically will not appreciably change the potential profile. Pipeline installations can vary by geometry, soil resistivity, pipe sizes, coatings, etc. Yet by knowing the potential gradient prior to installation, the engineer can predict whether the proposed pipeline will be subjected to stray current corrosion.

Mitigation of Stray Current

Electrical currents in the earth follow paths of least resistance. Therefore, the greater the electrical resistance a foreign pipeline has, the less it is susceptible to stray currents. Ductile iron pipelines offer electrical resistance at a minimum of every 18 to 20 feet due to their rubber-gasketed joint systems. This, in itself, is a big deterrent to stray currents. The effect of joint electrical discontinuity can also be greatly enhanced by encasing the pipe in loose dielectric polyethylene encasement in accordance with ANSI/AWWA C1051A21.5. Polyethylene encasement of the pipe in the defined area dramatically reduces the amount of collected stray current.

Throughout the United States, thousands of ductile iron and gray iron pipelines cross cathodically protected pipelines, yet very few actual failures from stray current interference have been reported. The bonding of joints and the use of galvanic anodes or drainage bonds may well be a solution to stray current interference in high current density areas, but these systems must be carefully maintained. In most cases, passive protective measures such as polyethylene encasement are more desirable.

This article was written by Richard Bonds, the current Research/Technical Director of the Ductile Iron Pipe Research Association (DIPRA). This brief excerpt is reprinted with permission from DIPRA; visit http://www.dipra.org/pdf/strayCurrent.pdf for the complete paper.
Got Source Protection?

by Eric Hanson, VRWA

Vermont has taken an active stance on source protection for public water systems. Since 1992, the state has required source protection plans (SPPs) for all community and NTNC water systems. The state also requires that SPPs be in place prior to the final permitting of new public community water systems.

A properly completed SPP is an invaluable resource for public water system personnel, regulators, and municipal entities such as planning and zoning boards. Source protection plans contain vital information for public water systems such as:

- Key water system information including source details, population served, and system demand
- Detailed mapping of the source(s) and source protection area
- Inventory and assessment of contaminant threats within the source protection area
- Identification of parcel owners within the source protection area
- Key contact information
- Contingency plan for water system emergencies that would affect the use of the source(s) serving the system

The primary goal of a properly prepared SPP is for a system operator or other water system personnel to have a one-stop manual explaining exactly how to proceed in the long-term protection of drinking water quality for the system. The plan also details what water quality threats exist and explains how to proceed in the very short term in the case of a water system emergency.

Source protection plans are also useful to community planners and regulators making management decisions regarding source protection areas within their communities.

Because of the changing dynamics of land use such as new development, varying agricultural uses, and changes in business use, Vermont requires that SPPs be updated every three years. This provides an opportunity for the water system to reevaluate activities occurring within the source protection area and adjust water quality management strategies as needed.

This also helps to ensure that the SPP is a living document, which can have current applicable use when called upon.

Closely associated with the completion of SPPs are monitoring waivers, which systems can apply for if their past test results and source protection plans show that the threat from certain contaminants is minimal or non-existent. Class II/V monitoring waivers can save systems considerable effort and keep testing costs low.

If you are a water system operator, are you using your SPP, or does it sit mostly unused on your bookshelf or in your file cabinet? If it’s time for an updated plan that will really be of use, VRWA has two Source Protection Specialists—Eric Hanson and Liz Royer—who can develop state-of-the-art SPPs and SPP updates for your water system. We develop comprehensive SPPs that meet all applicable requirements and are clearly and expertly presented to encourage frequent reference.

We strive to create SPPs that will be actively used by water system personnel as a key resource, complete with detailed photography and geographic information system (GIS) mapping. VRWA produces SPPs and SPP updates at no cost to public water systems.

In addition, if your public water system is one of several remaining in Vermont with a default source protection area (SPA), such as a 3,000-foot radius circle, VRWA has the expertise to re-delineate these areas using hydrogeologic methods. Such a re-delineation of your source protection area would result in a much more meaningful area in which to focus your source protection efforts, resulting in improved source water protection for your system.

For assistance with your source protection plan, plan update, applying for a monitoring waiver, or a re-delineation of your source protection area, call Eric Hanson at 802-660-4988 ext. 327.
The pore sizes are so small that even some bacteria cannot pass! The cleaned wastewater now leaves the membranes and enters the in-vessel ultraviolet system for disinfection. The effluent from this facility is always crystal clear and is less than 1 mg/l BOD and TSS.

This activated sludge/membrane system creates a sludge that routinely needs to be removed from the process in order to maintain proper mixed liquor concentrations. The waste sludge is removed from the system by septage haulers and is trucked off-site at a set disposal fee.

Cabot Plant Manager James Brimblecombe designed a sludge thickening tank to save the Town of Cabot sludge hauling and disposal fees. James contacted Wayne Graham of the Vermont Rural Water Association for help in getting the project underway. The final design and installation involved incorporating a 2,500 gallon poly thickening tank into the facility’s existing pumping and piping systems.

When the mixed liquor in the aerobic zone reaches a certain concentration (15,000 mg/l or 1.5% solids), the system’s return sludge pumps are used to fill the 2,500 gallon tank. The next day almost half of the volume is removed as clear decant and sent back to the influent of the plant. This process is repeated one more time, then the sludge (now concentrated to 40,000 mg/l or 4%) is ready for removal from the tank.

A septage hauler hooks up to the tank and empties it. Thickening the sludge removes water, reducing the volume of sludge and thus saving trucking and disposal fees.

James and Wayne worked over the summer to perfect the thickening system, which will reduce annual sludge disposal costs by a projected 30 percent! The Town of Cabot should be very proud of their operator’s cost-saving initiatives.

Happy Holidays!
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