Energy Cost Info You Really Need to Know and Understand

by Richard Winters,
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Earlier this year, I was asked to gather information on a few small water systems electrical costs as part of a survey being conducted by Dr. John E. Regnier, a consultant to the National Rural Water Association. The data collected from these systems included:

1. Two electric bills from each system meter location. (selected randomly by operator)
2. Pumping records (gallons per day), for each billing cycle. (some from multiple wells on same electric meter)
3. Horsepower amounts for all motors running off each meter.

The information needed for the survey from the electric bills included:

1. Meter location.
2. Billing Year.
3. Billing Month (with notation of whether bill was actual (A) or estimated (E) as weather allowed).
4. Billing Demand – Kilowatts (kW).
5. Actual Demand – kW.
6. Demand charge - $.
7. Energy Use – Kilowatt hours (kWh).
8. Energy Charge - $.
9. Water Production – Gallons.

This information may or may not be easily found on your electric bill, since all bills are not created equally. With the help of Dr. John, I learned how to retrieve the information. In order to make this data easier to interpret, I asked Dr. John to create an excel spreadsheet that I could enter the data on. Dr. John agreed to do this and added two formulas that calculated this information:

1. Water production in gallons per kWh used.
2. Water cost (electric only) per 1,000 gallons produced.

Dr. John is in the process of finalizing a White Paper that will be available soon on the National Rural Water Association's web-site that will give a complete breakdown of the energy saving potential you may also be able to achieve without having to spend anything. I am going to include some of the pertinent information found in the White Paper in an effort to get you to take a look at your energy costs a little closer.

United States Electric Utility Rate Structures and Measurements

In the US, billing commercial (as opposed to residential) customers for electric power use is normally a two-component procedure. First, the customer is charged for demand which is a measure of the generating, transformer and line capacity needed to be sure that customer has adequate power for his maximum needs at any time. This demand is normally measured in kilowatts (kW) for small to medium amounts, and is recorded on a special demand meter. These meters usually take 15 minutes to register the full amount of demand they see and this demand amount does not reset during the month until the meter reader manually moves it back to zero. Thus these meters record the maximum amount of demand presented to the meter during the month.

The second element of the power charge is frequently referred to as the energy charge and is the amount of time electricity is consumed at the established demand. This energy is measured in kilowatt hours (kWh) and is recorded on the same meter as the demand. Kilowatt hours are cumulative and thus the meter records the total accumulation during the month in contrast to the maximums recorded for demand. Special meters can also break both kW and kWh amounts down by the time of day they are accrued.

Here is an example of how this **Demand Charge** can drastically affect your energy bill:

There are a variety of ways that demand management can affect power bills. One of the simplest illustrations is a water booster station with a primary pump and a backup pump configured so that one or both pumps can be operated at the same time. Normal practice for the operator is to operate only the primary pump, but on occasion he wants to fill tanks faster and turns the backup pump on also for an hour or two. For a given month, assume he only operated the second pump for one hour. Unfortunately, due to the nature of demand electric meters, that meter will register the combined demand of both pumps for that month and the customer will pay a demand charge based on the combined figure. Numbers make this easier to understand. If each pump is rated at 50 horsepower, the combined demand will approach 100 kW. Demand is frequently billed at about $8.00/kW, so the demand charge for that month would

be about $800 whereas if only one pump had been operated, the charge would have been $400. In other words, that hour of convenience cost the system at least $400 that month.

Kilowatt hour management - is another way to significantly reduce energy cost:

Kilowatt hour management refers to ways in which electric power, primarily with regard to timing, is used at an established demand level. Two preferences of power suppliers govern the way their rate structures are formulated with respect to kWh charges. First, these suppliers like to shift as much power usage from high use periods to low use periods as possible. These periods are termed On Peak and Off Peak and most electric companies offer some price reduction for kilowatt hours accumulated during off peak times. These reductions can be substantial and well worth the effort required to shift usage.

Second, suppliers prefer to see equipment run for longer rather than shorter times or to stay "loaded" as much as possible. Again, price breaks are frequently offered in the form of lower kWh cost rates at higher kWh usages to encourage this practice.

Other things I found while collecting the data came as quite a surprise to me, some examples are:

1. A lot more operators of water systems than I would have ever imagined had never seen an electric bill until we needed them do collect the data.
2. At one of those systems we were able to discover a meter located on an abandoned storage tank. This meter was generating a bill for $39.00 a month for over ten years. This added up to over $5,000.00 thrown away and would have continued if not for the survey.
3. At another system, I was able to show the operator that he was paying less than $20.00 to produce that month's water supply and over $225.00 that same month to heat a separate building that the water passed through before entering the distribution system. A simple heat tape was installed and the heat turned off since they didn't use the building for anything else anyway.
4. At yet another system, I found a meter with a three-phase service left over from a well pump application that today serves a single 100 watt light bulb, not even needed in that building.
5. Bills are often estimated and these amounts are usually higher than actual usage would be. This can be minimized by making electric meters accessible, especially in bad weather.

With today's high cost of energy it behooves water and wastewater systems, which are energy intensive in operation, to take advantage of any savings opportunities that are available. Anyone interested in getting help with checking out their energy costs or using the above mentioned Excel spreadsheet, can contact me at Winters@nyruralwater.org or Dr. John Regnier at highpnt@mindspring.com