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Electricity Cost Control Through Bill Auditing Procedures

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Rate structures have to match facility requirements, or the owner pays the price

The only effective way to determine the potential for electricity cost reduction is to analyze or audit a facility's electricity billing. Knowing what the components of electric bills mean and how they affect overall electricity costs is important for building owners and their facility engineers and energy managers. Analyzing the individual cost components of a monthly electricity billing may seem daunting to the casual observer-especially when some of the terms seem like they were derived from a foreign language-but with help from a utility representative and articles like this one, it can be done.

Auditing electricity billings can mean many things to many people. Perhaps the most commonly held view relates to finding mistakes that the electric utility company has made that cause the customer excess costs. There are many utility-bill auditing consultants in the field that do just that: Audit utility bills to find mistakes and in turn base their fees on a percentage of the customer's utility refunds that might be due to them as a result of utility-caused errors. Utilities do make errors, but not many; if they do make mistakes, they are a result of misinformation or honest miscalculations. This author, for example, has never found a utility-caused error on a customer billing that was the result of a conscious effort on the utility's part to be dishonest.

Interpreting the data

What is more important in analyzing billing data is being able to understand the information on the monthly billing. The utility has the responsibility to place a customer on an applicable tariff rate classification; in turn, the customer is responsible for determining whether they are being served on the least expensive rate classification the utility has available. Surprisingly, the serving utility does not have the burden of putting the customer on the least costly rate.

Since cost is heavily dependent upon the usage characteristics of each customer, there are opportunities for savings from changing to a different rate classification.

The first area to investigate, therefore, is the one relating to alternate tariff rate schedules that may be available to a customer upon their request. Generally, the facility or plant engineer is the most logical individual to perform the audit or analysis of electricity costs. Armed with the knowledge of what alternate tariff rates may be available from the utility and what the components of electric bill costs are, the facility engineer can begin the investigation.

There are four key items that should be investigated with the electric-utility service

representative:

1. Complete Tariff or

Rate Schedule

A complete tariff or rate schedule covers all rates, terms, and conditions that were approved in a rate case. All classes of customers are addressed, including residential, commercial, and industrial. Contained in this document are all data relating to customer rates, costs, and terms for service. The importance of this source document cannot be overemphasized since it is mandatory for an understanding of utility costs. It is important that the complete schedule be available since only then can comparisons be made between different rates and options. A representative complete tariff or rate schedule will contain the following items:

- A complete list and explanation of all customer rates available.
- A complete list of all items or riders that modify or change rate costs.
- Alternative rates that may be available on a "customer request" basis for certain customer classes.
- Information on "enterprise zone" or other special local rates that may be available in economically depressed geographic areas.
- A complete explanation of how all cost components of utility usage are measured and applied.

Complete tariff or rate schedules remain in effect until a new rate case is filed and approved by the appropriate regulatory agency. Only one complete schedule is required for a given utility since all customer classes are addressed therein.

2. Experimental Rates

Experimental rates are not contained in complete tariff or rate schedules as they are developed on an experimental basis by utilities and are not mandated for any customer class. These types of rates are not available from all utilities but if they are, they can be a source of cost reduction potential. In addition, since these rates are developed by the utility and are initially approved on an experimental basis, the experimental category allows the utility to evaluate the potential for a different type of rate structure. Experimental rates are never mandated and are used only on a customer voluntary basis.

If an experimental rate proves to be successful, the common next step is to include it as an optional rate (rather than a mandatory rate) for a given customer class in the base tariff/rate schedule. The final step is to change the optional classification to mandatory for a certain customer class in the base tariff/rate schedule. Keeping up to date on experimental rates can be advantageous, as they have a way of becoming mandatory for some customer classes.

Building owners and facility managers should ask their utility service representatives if experimental rates are available. If they are, it is advisable to obtain a copy and determine the immediate applicability as well as the long-term implications if they are later included in the base-rate schedules as mandatory for the given customer class.

3. Off-Tariff Schedules

Off-tariff schedules differ from both base tariff as well as experimental rates in the way they are developed and applied. Off-tariff schedules are rates that are negotiated generally between a utility and a specific customer and as a rule-at least initially-are discriminating in nature. Rates of this type must be approved by the appropriate regulatory agency.

Once an off-tariff schedule is established, it may be available for any customer that has the same usage characteristics as the customer for which the rate was originally developed.

4. Rebate Program Schedules

Many electric utilities currently have peak-power-demand deficits. This means that although a utility may not have a base capacity problem, they may experience a peak-generation capacity shortfall during some periods of a 24-hour day.

To compensate for this peak-generation capacity shortfall, the utility can do several things. They can construct new generation plants (supply-side planning) that are very expensive, or they can offer their customers financial incentives to reduce demand during the utility's generation shortfall period (demand-side planning).

Many utilities offer rebate programs that encourage customers to reduce their demand needs by paying for or providing rebates for management strategies that favorably impact the utility's peak-demand shortfall problems. These programs change frequently, and sometimes a specific amount of money is allocated for a program, which means that when the money is expended, the program is ended.

One of the most efficient methods of obtaining utility information is through a straightforward letter requesting rate and tariff information. A sample inquiry letter is shown below.

Billing components

The second area of investigation to reduce electricity costs is to analyze the electricity billing components themselves. There are generally at least three basic cost components on any commercial or industrial electricity monthly billing. By thoroughly investigating each of these three items, one can determine where electricity costs are being incurred and where it would be most beneficial to spend time in reducing them. The three basic electricity cost components are:

1. Voltage Level. Many small- and medium-sized industries are taking over a service once provided solely by the electric utility: Converting high-voltage power supplied through a utility's transmission lines (128,000, 69,000, and 4,100 volts, etc.) to the low-voltage (440, 220, and 110 volts) used by most customers. They are doing this by purchasing or leasing transformer installations themselves. When a customer switches to a so-called primary or high-voltage rate from a secondary or low-voltage rate, electric costs are reduced.

Although large industrial users have been purchasing electricity at high-voltage rates for many years, smaller industries are just now investigating the procedure because of its cost reduction potential. In addition, utilities are willing to assist a customer in this effort since it helps them

attract and keep current business. The resulting savings can range from 3 percent to 10 percent of total electrical costs. The cost to convert to primary from secondary service varies greatly, but the cost can be minimized when utility-owned transformers are purchased at their depreciated value.

Successful conversions to primary voltage have been possible in cases where the total electric cost was as low as $20,000 per year. This is an area that could help reduce electrical costs greatly, and the process is simple to start. Utilities are the source of information and are generally cooperative in helping determine an end-user's potential for savings. To assist an energy user in a step-by-step analysis of the potential for primary voltage in a particular situation, the following guide is given:

If a client is served at a secondary voltage level and if the tariff schedule provides for primary voltage, perform the following investigation:

- Request that the utility calculate the annual savings of switching from secondary to primary voltage levels. There should be no charge for this analysis.
- Request that the utility provide the depreciated value of the transformation equipment necessary to convert to primary voltage. Utilities generally depreciate in a straight-line method from 30 to 40 years.
- Determine the most economical method to convert to primary voltage.

2. Demand.

Demand, as it applies to the monthly electricity billing, is defined as "the reservation of the capacity the utility has to maintain for the customer 24 hours a day, seven days a week, expressed in kilowatts (kW) or kilovolt-amperes (kVA)." There is no usage of electricity purchased in this portion of the billing, only the reservation of electricity capacity.

Peak or maximum demand charges are applied to the maximum demand for energy required by a system in a given period of time. Utilities charge a monthly fee based upon the maximum power (expressed as kilowatts, or kW) required in a given period of time, usually either a 15- or 30-minute interval.

The peak or maximum demand charge can vary from less than $2 to over $18 per kW per month. A control strategy to reduce these peaks can result in sizable savings. Many times a revision in how and when equipment is turned on or off can be all that is needed to reduce the monthly demand charges. In other cases, a computer-controlled energy-management system can be used to sense impending peak demands and adjust energy requirements to reduce peak demands.

The following steps can assist in determining and controlling peak demands:

- Determine current peak demand and the monthly charges related to it. This information can generally be obtained from the monthly utility bill.
- Contact the utility and request that a record of demand be provided for at least a one-month period. The purpose of this record is to document-in strip chart form by day and time-of-day-the variations in the electrical demand of the operation.

When the recorder strip chart is received, it will look very similar to an electrocardiogram in that it will show the peaks and valleys caused by changing demands. When the chart strip is analyzed, look for repetitive peak patterns from hour to hour, day to day, or week to week.

If there are repetitive patterns, determine what is happening at those times that cause the peaks to occur, e.g., start of a work shift, employee break or lunch times, equipment testing, and other obvious events,

Once the information is received on the peak periods, a determination can be made as to the corrective action to take. It is advisable to not try to reduce demand to an unattainable level, but rather to reduce perhaps the top 25 percent or 30 percent of the peak periods.

This is not only a less costly approach, but in most cases can be done by either operations changes in equipment usage or personnel schedules. It helps to work with the utility company on this since they can provide technical insight into how to lower specific peak demand. Demand is billed in at least two different ways: Non-time-differentiated and time-of-use/time-of-day.

Non-time-differentiated demand billing means that the maximum peak-demand period will be billed at a fixed rate without regard to when the demand occurred.

Time-of-use/time-of-day demand billing means that the maximum peak demand period will be billed at a variable rate depending upon what time of the day, or in some cases, what time of the year the demand occurred.

3. Usage.

Usage (kWh) is a function of connected load multiplied by hours of usage; for example, 1 kWh = 1,000 watts sustained for a one-hour period. Therefore, ten 100-watt incandescent lamps operated for one hour would result in the use of 1 kWh of electrical energy; or, one 1,000-watt piece of equipment operated for a one-hour period would result in the use of 1 kWh of electrical energy usage.

Reducing usage (kWh) of electricity requires the use of more energy-efficient equipment or a reduction of the quantity or time of operation of individual pieces of electrical equipment. Each individual analysis for usage (kWh) reduction is unique, based upon the peculiarities of a given situation.

Electricity use can be reduced in specific areas such as mechanical, lighting, and power-distribution systems. For lighting systems, the reduction of demand charges might involve the analysis of such items as high-frequency, electronic fluorescent-lamp ballasts, compact-fluorescent lamps, or high- or low-pressure sodium lamps in areas where color rendition is not critical. Other items to examine include the use of utility-sponsored rebate programs to purchase and install energy-efficient electric motors and other equipment types.

Keep on track

While studying the best options for reducing usage and demand, building owners and energy managers must remain vigilant in tracking energy use. The best method of tracking the three basic electricity cost components is to develop a "tracking form." An example of a typical tracking form is shown on page 22.

Once facility decision-makers have determined the best tariff schedule rates for their specific operational conditions and have investigated the basic electricity cost components on the monthly billing, they are well on their way to not only reducing electricity costs, but also understanding what the billing actually means.

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