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The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Understanding Electric Utility Billing

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Introduction

The first step in trying save money on electric, gas or fuel costs is to understand how the energy usage is being billed. Petroleum products (gases and fuels) are somewhat straightforward; however, electrical energy and power billing can be confusing.

Electricity is a unique energy source in that it cannot be economically stored by individual users. The utility must be able to provide whatever need there is immediately. This is known as "demand." Not meeting this immediate demand, or capacity, can lead to widespread problems for the utility and customers. Basically, the utilities must predict the largest need in their territory and then overbuild generating, transmission and distribution equipment in order to supply this demand - plus a margin for future growth. This over-sizing of equipment is expensive and the utility recaptures this investment through various components of the electricity bill.

Another aspect of electrical energy usage is that the system demand problems tend be worse during certain seasons and times of the day. In the summer, air conditioning loads will be highest in the afternoon and evening as the sun heats residences and buildings. Also, people will be coming home from work and starting evening chores. In the winter, the electrical system may experience increased loads in the early morning and afternoon. These peak loads vary largely depending on what types of heating and cooling systems (gas or electric) make up the majority of buildings in the utilities' territory.

In many cases, the utility systems are close to full capacity. That is, any significant additional load (demand) will strain the existing equipment such as lines and generation. Utilities use pricing methods, or signals, to encourage customers to reduce usage during periods when the utility system is nearing its peak capacity. These signals are often written into the customer's rate schedule. Understanding the rate schedule often leads to the ability to save energy costs.

Reading and Understanding Your Electric Utility Rate Schedule

As an electric utility rate-paying customer, you have a right to read and understand your electric rate schedule (sometimes called the "tariff"). In fact, it is difficult to successfully lower your electrical utility costs until you understand your rate schedule. However, few rate payers have ever actually looked at their rate schedule.

Many rate schedules are posted on the internet. Simply search for your electricity provider and look for "rates," "schedule" or "tariff." You can also call or write your utility and request a copy of the rate schedule you are on. It is better to have an actual copy in hand rather than try to copy a verbal description.

What follows is a short description of the terminology and the billing components you will likely encounter on the rate schedule and a generic example of a small commercial time of use (TOU) demand rates schedule. Rate schedules vary between utilities but are usually a combination of the pieces shown below. Your schedule may be different, but this example shows some of the basics of electric rate schedule construction.

Generic Commercial TOU Rate Schedule with Tiered Energy and Power Factor Charges

Rate:

Customer Service Fee:	$25.00 per customer/month
Plus	
Demand (kW) Charge:	$8.00 per month kW of billing demand
Plus	
Energy (kWh) Charge Summer:	First 10,000 kWh billed = $0.09/kWh
(Summer = July 1 – Sept 30)	Over 10,000 kWh billed=$0.05/kWh
Or	
Energy (kWh) Charge Winter:	First 10,000 kWh billed = $0.06/kWh
(Winter = Oct 1 – June 30)	Over 10,000 kWh billed=$0.035/kWh

Power Factor: For measured customer power factor less than 90 percent, the demand charge will be the measured demand multiplied by 90 percent and divided by the measured power factor.

Typical Electric Utility Schedule Billing Components

kWh (Kilowatt-hours) also called: "Energy" or "Consumption."

This is the amount of electrical energy that is used over time by the consumer. A kilowatt is 1,000 watts and a kilowatt-hour is 1,000 watts used for one hour. For example: Ten, 100 watt lamps that ran for one hour would have used 1 kWh.

Think of the odometer on your car. The kWh's are similar to the number of miles your car traveled during a certain time period.

kW (Kilowatt) also called "Demand."

This is the amount of power that a customer's facility or operation is pulling (demanding) from the utility electrical system at a given moment in time. Actually, the time period is not instantaneous but usually a 15 minute average (advantageous for the consumer). In our lamp example, the ten, 100 watt lamps are pulling 1,000 watts (1 kW) at any time they are on. Therefore, the lamps have 1 kW of demand. Demand is similar to the miles per hour needle on the speedometer telling us how fast we are going at any particular point in time.

Power Factor (PF) also called "Reactive Power."

This concept is a bit complicated but basically it is a measure of how effectively the customer is utilizing the electrical energy the utility provides. You might think, "Why should the utility care *how* I use my electricity?" Power Factor problems on the customer's end are a problem for the utility system also. This is a phantom load that the utility must provide but does no useful work for anyone. Power factor is a percent or fraction, less than or equal to one, and is considered bad if it is "low" (for example, a PF of 50 percent or 0.5 is not good). Power factor is a problem if the customer is: (1) on an account that has PF billing and (2) has large inductive loads like big electric motors. Residential and small commercial accounts typically don't have PF billing.

Demand Ratchet

This component of electrical demand (kW) billing is a way the utility attempts to get consumers to even their load during the year (month to month). In the demand billing section of your rates you may find wording such as: "In no case will the billed demand be less than 70 percent of the maximum demand established during the past 11 months." What this means is that if the customer sets a year high peak demand of 1,000 kW (larger farm operation) in June, the minimum demand for next eleven months will be the greater of the actual demand used or 700 kW. This could be important for agricultural customers who only operate a few months a year.

Time of Use Rate (TOU)

This is a type of billing schedule that assigns higher costs to electricity usage (usually kWh) depending on the time of day and season. As mentioned in the introduction, this billing is done to motivate customers to move loads to different (off-peak) periods. The difference between "on" and "off-peak" costs vary. Typically the higher rates during the day will occur in the early afternoon to early evening (for example, 2:00 pm to 8:00 pm).

Tiered Energy Charge

Some utilities charge less per kWh – the more you use (some utilities may charge more). Regardless, this "tiered" or "block" structure will show up on your rate schedule. An example might be that the first 2,000 kWh used in a month are charged at $0.08 per kWh. Any usage above 2,000 kWh that same month is charged at $0.035 per kWh.

Load Factor

This is different from Power Factor. Some utilities base the charges on the customer's load factor. Load factor is a measure that describes how level, or consistent, the customer's electrical usage is throughout the month. For instance, a facility that used the same amount of electrical power day and night for a month would have a load factor of one. This is good from the utilities' standpoint (easy to plan capacity). A facility that uses a significant amount of energy for a few hours, and then shuts down for long periods (for example a church), would have a low load factor. One way to calculate a monthly load factor is to divide the month's total kWh by the maximum measured month's demand (kW) times 720 hours in the month.

Example Electric Bill with Time of Use (TOU), Demand, kWh Tier, and Power Factor for a Commercial Account (like a Large Poultry House).

This is a hypothetical electric bill that demonstrates several of the concepts described above. The bill and rates are fictitious and actual bills will vary.

Rate: Use the generic TOU rate schedule shown above in this fact sheet.

Example Bill Calculation

Let's assume that this poultry house used 27,532 kWh in July with a measured demand of 120 kW. Their metered power factor was 62 percent (0.62). What would the bill look like?

Customer Service Fee - $25.00

Demand (kW) and Power Factor

Maximum of:

Measured demand - $8.00/kW x 120 kW = **$960**

Or…

Power Factor Calculation – (120 kW x 0.9)/(0.62) = 174 kW x $8.00/kW = **$1,392** (This is the higher number so this is what will be billed for demand)

Energy (kWh)

10,000 kWh x $0.09/kWh = **$900.00** (First Cost Tier Summer)

27,532 kWh – 10,000 kWh = 17,532 kWh x $0.05 **= $876.60** (Second Cost Tier Summer)

Total Bill (not including taxes): $25 + $1,392 + $900 + $876.60 = **$3,193.60 (+taxes) for month of July**

How is Understanding the Rate Structure Useful?

Let's look at our hypothetical poultry operation. Knowledge of the rate schedule gives the operator several opportunities to possibly lower electrical costs. Notice, we did not explicitly say "lower electrical energy use." We are talking about taking advantage of rate schedule knowledge here – energy conservation is different and would add to the savings.

Is there a way to lower the demand cost? Is it possible to not have as much equipment running at the same time during the month? If we can try not to run everything simultaneously, we would save energy and demand costs.

The low power factor (62 percent) is increasing the demand cost in this example billing month by about $432. If not corrected, this will cost the facility an additional $5,184 per year for electricity that is not doing anything. Look to the electric motors or other systems to figure out why the power factor is so low.

Maybe some operations could be done at different times of the year. Suppose that the work done in July could be done during other months of the year besides the three higher-rate months of July, August and September. Using the cheaper winter rates, the 27,532 kWh charge would cost $1,213.62, not $1,776.60 – a savings of $562.98 for that month. Maybe the operations cannot be done at different "off-peak" times, but you see the possible opportunity here.

If the rate schedule had a time of day cost (another type of TOU rate) that went up for six hours in the afternoon in the summer (this example did not), the operator might be able to reschedule some operations to early morning or evening. In some utilities' territories, the cost difference between peak and off-peak time of use is significant. Ironically, the more complex the rate schedule – the more opportunities there usually are for cost savings.

Summary

Knowledge of your electric rate schedule is important in understanding how you can save money on your bills. The future of electrical utility billing will probably include new rate structures such as real time pricing. This will ***require*** that the consumer be aware of electrical usage and specifics of the bill in order to minimize costs. Understanding your current electrical rate structures is also a great way to prepare for these new billing methods and maybe save some energy costs now. If you have questions about your electric rates, call your utility for clarification.