



# Understanding Electric Consumption & Demand Charges

Electric energy prices have been rising at a pretty constant rate for the last few years, and more rate increases are predicted for the near future. If you've ever had a chance to study your utility bills you probably noticed that the majority of your total cost is comprised of charges for *consumption* and charges for *demand*. In some cases the *demand* charge can exceed the *consumption* charge, and in many cases the *demand* charge accounts for nearly half of the total bill or more when *power factor penalties* are present. It's a good idea to understand how electric consumption & demand charges plus penalties are calculated, so you can determine the best ways to limit both and save your enterprise some money.

***Electricity is Energy, But Knowledge is Power!***

## Consumption (Generation)

Your electric *consumption* (sometimes known as *generation*) charge is easy to understand and calculate. *Consumption* (generation) is measured in kWh (kilowatt hours). (Wattage is calculated by using the equation, Volts x Amps = Watts. Convert watts to kilowatts by moving the decimal point three places to the left.)

This is a measurement of the amount of energy you use during the billing period or, in other words, your electricity usage in a given cycle. kWh prices vary widely. Depending on your geographic location and your utility rate plan, you could be paying as little as \$0.04 or as much as \$0.30 per kWh or more.

**EXAMPLE A: If your business used 10,000 kWh during the billing period (usually about a month), and your rate was \$0.10/kWh, then your *consumption* charge would be:**

$$10,000 \text{ kWh} * \$0.10/\text{kWh} = \$1,000$$

You can reduce the amount of kWh you consume by making sure that energy consuming equipment like lights, office equipment, exhaust fans, HVAC, battery chargers and motorized equipment are turned on only when needed. The PowerLink automatic and static power factor corrections units will also provide the perfect solution for reducing wasted amperage (power) when equipment must be running to operate your business.

## Demand

*Demand* charges are additional fees that utilities charge non-residential or commercial customers for maintaining constant supply of electricity. Demand can be defined as: *The maximum amount of energy a business uses at any given period in a billing cycle.*

*Demand* can be a more complex subject. To the electric utility, *demand* represents the amount of electrical power that has to be generated at any given time. In other words, the utility has to be able to deliver enough power, at any time during the day, to deliver the maximum amount of power needed by all of its customers. As demand increases, more sources of power must be found – this can be very expensive. That expense is usually passed on to the utility's customer base. To the consumer, *demand* represents how fast you use energy and how efficiently you use it which is also reflected in your power factor numbers.

The speed at which you use electrical power at a given point in time is measured in kW (kilowatts). (Wattage is calculated by using the equation, Volts x Amps = Watts. Convert watts to kilowatts by moving the decimal point three places to the left.) Your *demand* will vary from minute to minute as HVAC cycles, lighting, machines and other loads are turned on and off. The electric utility usually measures *demand* as an average of the power you draw in a 15 minute period. Very short bursts of *demand*, for instance when *demand* surges occur when electric motors turn on, will usually have little effect on the average 15 minute *demand*. But, longer periods of *demand* will have a big impact. For instance, leaving a large electric motor (i.e., a conveyor belt, compressor or etc.) turned on constantly will have a significant impact on your 15 minute *demand*.

The unit cost of *demand* (kW) is always much higher than the unit cost of *consumption* (kWh). *Consumption* is typically charged at a few cents per kWh. *Demand* is usually charged at a few to several dollars per kW.

***As you can see from above, the interrelationship of Demand and Consumption are so intertwined that a reduction in one creates a reduction in the other.***

**EXAMPLE B: Using EXAMPLE A, and applying a *demand* charge – for instance 100 kW average 15 minute *Demand* charged at \$10/kW – the monthly bill would become:**

$$10,000 \text{ kWh} * \$0.10/\text{kWh} + 100 \text{ kW} * \$10/\text{kW} = \$2,000$$

***Demand* charges just doubled this monthly bill**

## Power Factor

Your *demand* charge can also be influenced by a characteristic called *power factor*. Power Factor (PF) is a charge or penalty that is obvious on some electrical bills, or hidden deep in the demand charges on others. *Power factor* is a measure of how efficiently your site uses electrical energy. If your equipment uses energy inefficiently, it will exhibit a low *power factor* and the electric utility must have more generation capacity online to serve your needs. On many electric bills, you'll see your *power factor* measurement. *Power factor* is denoted as a percentage. A 100% *power factor* means your equipment is using power with 100% efficiency. Utilities usually apply a multiplier to your *demand* charge for *power factors* below 90%. *Power factor* multipliers of 1.2 to 1.5 (or more in some customer areas where penalties are progressively increased as power factors get lower) are common.

**EXAMPLE C: Using EXAMPLE B, and assuming an 80% Power Factor and a 1.5 Power Factor Multiplier the monthly bill becomes:**

$$10,000 \text{ kWh} * \$0.10/\text{kWh} + (100 \text{ kW} * \$10/\text{kW}) * 1.5 = \$2,500$$

**If your building uses energy at a low *power factor*, your bill will increase.**

And finally, you may also see two different types of *demand* on your bill - *actual demand* and *billing demand*. *Actual demand* is just what it sounds like – the highest *actual* average 15 minute *demand* measured during the billing period. The *billing demand* is the highest 15 minute *demand* measured at your site in previous months. Each month, you could be billed the higher of these 2 numbers. Bills that show both *actual demand* and *billing demand* use a factor called *demand ratchet*. This simply means that if you *demand* a lot more power during one month – for instance during July in Miami – then the highest average 15 minute *demand* for that month will be billed for July and the next 11 months, even if the *actual demand* is lower during subsequent months. The only exception to this rule would be if your *actual demand* was greater than the July *demand* in a subsequent month – for instance August in Miami – then the *demand* that would be billed would increase to that higher number for August and used as the *billing demand* for the following 11 months, regardless of your *actual demand*. When your rate includes a *demand ratchet*, you will be locked into your highest *demand* for 12 months (some utilities use 6 months, some others use 18 months, but most *ratchet* plans use 12 months). Managing your *demand* is always a good idea. Managing your *demand* when you have to live with a *demand ratchet* is critical.

## A Power Factor Management System Can Help

A properly sized, engineered, and designed PowerLink Power Factor Correction System can help you reduce your electric *demand, consumption*, and your *power factor penalties* subsequently reducing your monthly electric costs. Power factor charges can result in a significant increase in your electric bill. We can eliminate these overcharges with equipment designed by our expert staff. A power factor correction project can provide several advantages, including:

- Eliminate expensive added charges
- Decrease power purchased from utility
- Increase electric power equipment capacity, in such as transformers or load center panels
- Improve voltage to electric loads and smooth out power quality variations
- Reduce resistance losses in the customer's power distribution system

We can analyze your monthly electric bills, visit the facility to properly design the equipment and installation, and make a turnkey proposal to eliminate monthly power factor charges. This might include power factor capacitor equipment mounted near the incoming utility meter, a metal-enclosed capacitor system positioned in the main electric room of the facility, or equipment at individual motors. We provide a written proposal that identifies the estimated monthly power factor costs, the project total cost, and economic indicators. We can also implement a proposed power factor correction project, structured to meet your needs. This process can be for equipment and engineering support only, or can include installation and commissioning (turnkey) services with a single-source of responsibility.

### Summary

Following an on-site survey, PES will provide a detailed report that will clearly show if this technology is feasible and will work for you. Using our proprietary equipment to identify the Power Factor of your plant and/or factory's equipment, you can realize substantial savings, improve the efficiency of your electrical equipment, and help prevent shutdowns or delays due to overheating machinery. It may take some preliminary analysis and/or investment in energy-efficient equipment, but you can realize long-term energy savings by measuring your facility's Power Factor and applying suitable power factor correction techniques.