



UNDERSTANDING COMMERCIAL & INDUSTRIAL POWER BILLS

Over many years, utility companies have turned billing into an art form designed to confuse customers and prevent them understanding how they're being charged.

As a result, very few companies can interpret their bill accurately, either to understand how much power they really use or how they're billed for it. Obviously, understanding these two elements is the first step toward developing a worthwhile energy efficiency plan.

Your Power Bill is not a 'Given' It's well worth your while putting some time in on this because there are many opportunities available to you for reducing it. This document is intended to provide a 10,000 foot view of some of those opportunities.

What you are billed for Almost all electric utilities bill their industrial and commercial customers for 2 things in every billing cycle:

- **A 'Capacity' or 'Peak Demand' charge** - the maximum number of kilowatts (kW) your facility uses during the highest 15 minute period (30 minutes for some utilities) during the month.
- **An Energy charge** - the total amount of energy consumed during the bill cycle, measured in kilowatt-hours (kWhs).

The Capacity or Peak Demand charge is justified by the utility because they must reserve enough generation and delivery capacity to meet every customer's maximum demand for electricity, even though they use less than the maximum demand most of the time.

The Energy charge is the number of kilowatts used times the number of hours they were used for, giving a total in kWh. This should be a simple calculation, but it isn't, because they break the bill down into 4 categories, each of which can have up to 4 sub-components!

Basic Calculations The number of kW and kWh consumed by a facility during the month is measured at the meter, and is charged separately for each of the 3 or 4 main categories of your power bill.

- **Generation** The only item on your bill that can (sometimes) be bought from a separate supplier. The other 3 items must be bought from the local utility, which owns the wires and switchgear.
- **Transmission** From the generating plant to your transformer
- **Distribution** The "final mile" from the transformer to your building
- **Transition** "Stranded costs" from deregulation, nuclear plants etc.

Not only are there 3 or 4 main categories on every bill, but the kWh used are not all charged at the same rate within any one category. Typically there are 4 'buckets' of kWh in the Summer and 3 'buckets' in the Winter for each category, each bucket being charged at a declining rate as the volume goes up.

Example The following analysis is based on PECO's 'General Service tariff' (a 'secondary' tariff where the utility owns your transformer) as opposed to their 'HT tariff' (a



'primary' tariff used by larger entities), where prices are lower but the customer is responsible for maintaining the transformer.

All figures below are from a plastics injection molding company's bill – see last page. They have 20+ hydraulic molding machines. A typical month's Generation charge for their plant looks like this:

Total kilowatt-hours consumed	69,900 kWh
Bucket 1	32,296 kWh x \$.0344
Bucket 2	32,296 kWh x \$.0162
Bucket 3	5,208 kWh x \$.0103

A similar calculation is repeated for each of the other main categories of the bill (transmission, distribution, transition), though the prices per bucket of kWh may be different for each category.

Obviously, you want all your kWh in the cheapest buckets while the utility wants them all in the most expensive buckets.

So, what determines how many kWh fall into each bucket? The answer is your Peak Demand (or Capacity) charge, though you can't tell from your power bill how this calculation was made. The Demand Charge itself has 2 components

- **Metered Demand**
- **Billed Demand**

Metered Demand is the peak demand actually used by the facility in kW, measured during the highest 15 or 30 minutes of use during the month. If the customer has a lot of large motors switching on at a particular time of day, the peak demand will probably occur during that period. Solutions to this would include staggering the switch-on times of the equipment and/or installing soft-starters (e.g. Powerboss).

In the injection molding plant example above, the Metered Demand was 341 kW. Every 1kW of peak demand that can be eliminated results in \$13 of savings on that month's bill (under PECO's secondary tariff, or \$24/kW under their primary tariff). For example, if you can reduce your peak demand by 100kW, the bill would fall by \$1300 (or \$2400) that month, in addition to the kWh savings from normal operations!

Billed Demand is a calculated figure which can be equal to or higher than Metered Demand, depending on the overall 'power factor' of the facility. Power Factor is a measure of the plant's efficiency in using the power delivered by the utility. Inefficient plants with low power factors may be liable for a power factor adjustment or penalty.

Power Factor Adjustment Customers who operate large motors, step-down transformers and welders will tend to have lower power factors.

A utility has to invest in higher capacity equipment (heavier wire, larger transformers) to serve a customer with a poor power factor. Customers with 'perfect' power factor would have a reading of 1.0. A power factor under 0.85 is typically considered "poor".



PECO requires an overall power factor of 0.90 for an entire facility. If they see 0.90 or higher, the Billed Demand is equal to the Metered Demand, but if they see a lower (worse) power factor, they apply a 'Power Factor Adjustment' which increases the Billed Demand above the Metered Demand.

In the case of the molding company, their facility power factor was 0.76, so the Billed Demand was calculated as the Metered Demand of 341kW x (the target power factor 0.90/the actual power factor 0.76) = 404 kW, so they were paying an extra \$820 a month!

An important, but little understood, secondary effect of a higher Billed Demand than Metered Demand is to put more kWh into the higher-priced buckets and fewer into the lower-priced buckets.

Only a detailed analysis of the utility's tariff can determine exactly how this works. It cannot be derived from the bill. Applied Energy can help with this analysis, if needed.

Basic Rate Structures. Industrial and commercial electric rates tariffs fall into two basic types:

- **Time-of-Use**
- **Stepped**

In a Time-of-Use tariff, the utility charges a different rate for energy depending on when you use it, because a utility's cost to produce or purchase electricity varies with the time of day. The most typical time period definitions are:

- 'On-peak' Monday thru Friday, normal business hours,
- 'Off-peak' Monday thru Sunday, nighttime hours, and
- 'Shoulder' ... Weekend, daytime hours.

On-peak energy rates are usually higher than shoulder energy rates which, in turn, are usually higher than off-peak energy rates.

In a Stepped rate tariff, the utility charges a lower energy rate as consumption increases, because as a customer consumes more kilowatt-hours, it is likely that the additional energy is being used during the lower cost shoulder and off-peak periods. Stepped rates can have two, three or even four different energy rate "buckets".

In addition to the two basic rate structures, utilities have incorporated a number of special penalties and incentives into their industrial and commercial rates.

Demand Ratchets. Most of the nation's utilities experience the maximum demand on their systems during hot Summer afternoons. Consequently industrial and commercial customers that peak during the Summer place the greatest burden on the power grid. Some utilities account for this fact by incorporating a demand ratchet whereby a customer's billed demand in any non-Summer month cannot be less than a percentage (say, 75%) of the maximum demand the customer set during the previous summer. This is a gift that keeps on giving!

Curtailment Programs

As electricity demand rises, and generation and transmission capacity does not, there's increasing pressure on many utilities to reduce consumption, particularly on hot Summer



days. If you have the ability to reduce your consumption when asked to by the utility, you can receive significant financial benefits from many utilities. The good news is that the duration and amount of the curtailment required is remarkably limited in many cases, and may only impinge on your production minimally. Applied Energy can advise you on programs offered in your utility area.

Energy Efficiency Equipment rebates/incentives

In many Northeastern states, the utility companies offer a variety of incentives and rebates to encourage you to invest in more energy-efficient equipment. These rebates are available for many types of equipment (chillers, motor controls, lighting, etc.) and can cover a significant part of the overall project cost.

Economic Development Incentives. Most electric utilities also offer incentive rates to encourage business and industry to relocate or expand in their service territory. Economic Development Rates are sometimes supported by specific, low cost generating units. An example of this is the New York Power For Jobs program administered by the NY Power Authority. The incentives usually are discounted energy and/or demand charges for electricity consumption above some baseline level.

Time-of-Day Billing. Utilities that use a Stepped Rate structure typically charge for the peak demand set by the customer at any time during the billing cycle, even if it occurs late at night when the demand on the power grid is low. To give credit to customers that can shift their maximum electric demands to off-peak periods, some utilities offer Time-of-Day Billing options. Under Time-of-Day billing, the customer is only charged for the maximum electric demand that they set during the critical on-peak period.

Taxes Local and State governments can levy various taxes on the production and delivery of electricity. The most common categories include franchise taxes, sales/use taxes, and gross receipts taxes. In many states, taxes on electricity use can be avoided by certain types of manufacturing industries. Applied Energy can help you determine if you are taking advantage of available tax avoidance opportunities.

If this all seems unnecessarily complicated, it is! To some extent it's a function of how utility tariffs have developed over time, and partly it's in the utilities' interest to ensure that customers can't fully understand what they're being billed for, or how the charges are calculated.

Applied Energy can analyze your bill and help you understand how you're being charged for the power you use. This is first step in being able to reduce your overall power costs. If you are interested in finding out more, please call Kit Gutteridge at 484-802-2422.

How to Attack Power Costs Applied Energy can analyze your bill and help you understand how you're being charged for the power you use. This is first step in being able to reduce overall power costs. For example, you may be paying a high kWh rate, or perhaps a lower kWh rate but a high Peak Demand rate. There may be Summer/Winter ratchets in place or some other mechanism that's costing you money unnecessarily.

If you are interested in finding out more, please call Kit Gutteridge at 484-802-2422.