Electricity Metering & Billing

How much does your company pay for power? Most likely it is one of, if not your single largest expense. Unfortunately, you are probably over paying for it. You may think that because your company requires electricity to operate, essentially your hands are tied and that your bill is a fair representation of the service the Electrical Utility provides. The truth is that if you are not meticulously tracking your electrical consumption you are losing thousands of dollars every month.

Understanding your Bill: There are many different ways a Large Industrial customer is billed by the electric utility, a quick look at your bill will reveal that you are paying for kWh (consumption), kW (demand), and kVA (apparent power). Let's begin by establishing the difference between kWh and kW.

Demand (kW) vs Consumption (kWh): Simply put, a cars odometer acts like a consumption meter while its speedometer acts like a demand meter. Consider the following example: two people must travel the same 150km stretch of road to arrive at their destination. The first person drives their Volkswagen Beetle at 50km/h and arrives in 3 hours, the second drives a Ferrari California at 150km/h and arrives in just one hour. Both cars have registered 150km on their odometer (equal consumption), but the Ferrari has accomplished this in 1/3 of the time. This is because the Ferrari's demand is 3x higher. It takes a much more expensive and powerful engine to accelerate a vehicle at 150km/h than it does to accelerate a vehicle to only 50km/h, and this represents the infrastructure the utility must provide in order to supply a large demand

Consumption = 150km, Demand = 50km/h

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How to Save on Consumption and Demand: Obtaining information about actual electricity usage is an important first step. Tracking your usage over time will not only help reduce overall consumption but will also expose high energy habits as well as the lulls in your daily routine which will present the opportunity for staggering loads throughout the day to lessen your overall demand and reduce peaks. Electrical meters at substations will measure and record useful data for improvements.

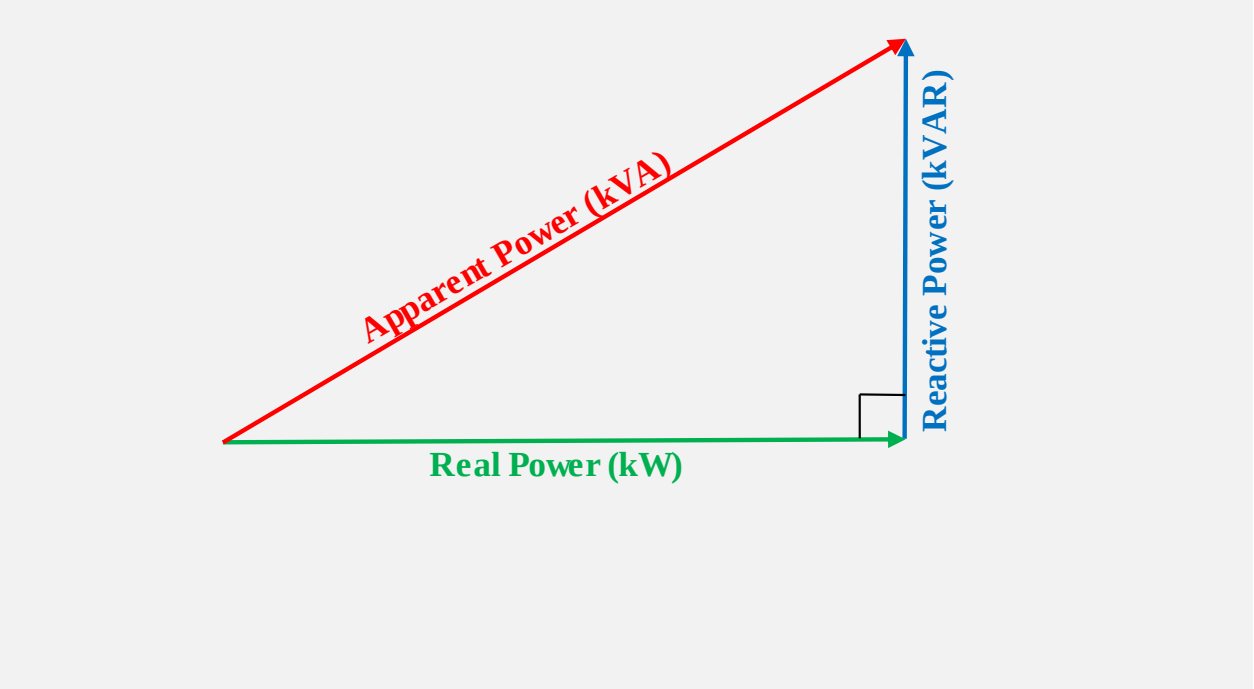
Apparent Power (kVA), Real Power (kW), Reactive Power (kVAR) and Power Factor: As mentioned earlier, you are being charged for kVA by the utility. What exactly is kVA? Let us first continue with the kW (kilowatt) that was the topic of our previous example.

(kilo is a metric prefix denoting a factor of 1000, kilogram = 1000 grams, kilometer = 1000 meters, kilowatt = 1000 watts)

kiloWatt (kW) – Watts are known as real power: they create heat, motion and are used to do useful work. *(Example: your baseboard heaters use Watts to heat your home)*

kiloVolt-Amp-Reactive (kVAR) – VARs are created when an electrical systems voltage and current are out of phase (caused by capacitance or inductance) and are common in an industrial setting. They do not create heat or perform useful work, and should therefore be kept to a minimum. *(Example: electrical motors create inductance and cause voltage to lead current, creating VARs)*

kiloVolt-Amp (kVA) – Volt-Amps are the vectorial sum of both Watts and VARs (see below)



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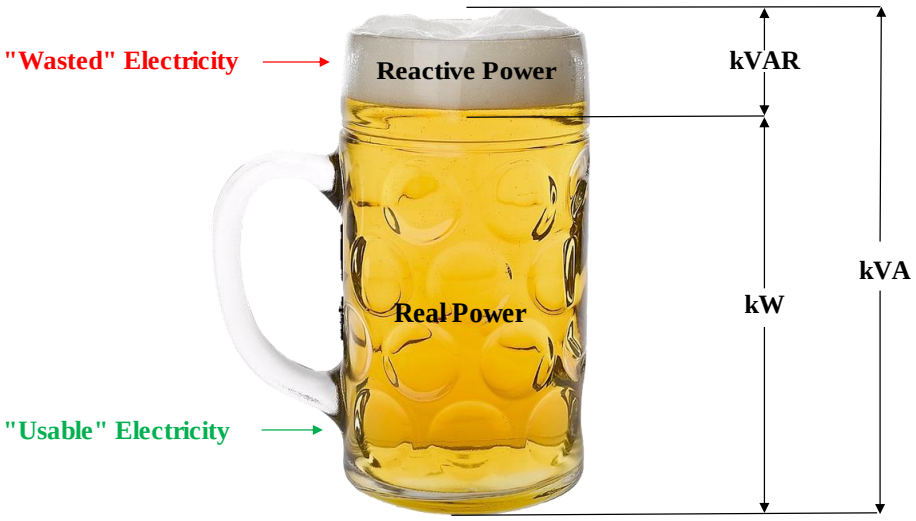
The utility is charging you based on your total Volt-Amps, which (as explained in the previous diagram) is a combination of Watts (real power) and VARS (reactive power). The problem being that VARS are essentially a by product of certain industrial processes and are **not useful.** This means you are paying for reactive power that you **cannot** use.

`The ratio of Watts (real power) to the total Volt-Amps (apparent power) is referred to as **Power Factor (W/VA=PF).** This ratio represents the percentage of Watts contained in the Volt-Amps you have been billed for.

Let's look at another example that may be a little easier to understand.

It is a very hot day and you decide to pour yourself a cold non-alcoholic beer to cool off, but a problem arises:



You have paid for the entire contents of the bottle, but because of the glass and the method in which you poured your tasty beverage, a layer of foam has been created. The layer of foam does not quench your thirst and that part of the drink has essentially been wasted.

How to save on Power Factor (kVA): The equipment and methods used in your electrical consumption, as with pouring, will waste power and more importantly: money. Unfortunately improving your power factor is not as simple as tilting a glass, and requires careful engineering to avoid creating other problems with voltage and harmonics. Correcting your power factor requires tracking of several facets of your power bill, trending those values over time to reveal what processes are causing the phase shift between voltage and current, their magnitude, and the time and duration for which said processes occur. You may need power factor correction equipment (capacitors with filters) added to your system to offset the VARs your company produces.

Summary: The benefits, including cost savings, from power factor correction, demand reduction and other improvements are more easily realized with the engineered installation of a suitable substation electricity meter. Once installed, your meter data can be accessed over networks to view real time data or to log data for trending, analysis, troubleshooting and comparing to utility bills. Meters at multiple remote sites could be accessed from one central monitoring location and will help shed light on possible solutions to improve power usage. Regardless of your requirements, metering and recording electricity usage most often identifies opportunities for saving and improvements that pay back the cost of the installation and continue to provide savings.

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