



## **Power Factor: Frequently Asked Questions**

Power Factor is used by electric utilities to monitor efficiency. Keys Energy Services (KEYS) calculates a Power Factor adjustment for large commercial customers - the adjustment corrects the demand billing. Large commercial customers should note that KEYS does not benefit monetarily by having commercial customers improve their Power Factor, but rather benefits by reducing power losses and needing to purchase additional power from the mainland.

### **What is Power Factor?**

**Answer:** The ratio of real power (kilowatts) to apparent power (kilovolt-amperes) used by an electrical device in an alternating current (AC) circuit. When the real power consumed (watts) is divided by the product of voltage (volts) times current (amperes) and the quotient is multiplied by 100, the result equals the power factor:

$$\frac{\text{Watts (real power)}}{\text{Volts x Amperes (apparent power)}} \times 100\% = \text{Power Factor}$$

### **What is Real Power?**

**Answer:** Real power is sometimes referred to as actual or working power. It is the current (and voltage) actually consumed and registered on the meter at your location. It performs the actual work, such as creating heat, light, and motion. Working power is expressed in kilowatts (kW), which registers as kilowatt-hours on your electric meter.

### **What is Reactive Power?**

**Answer:** Does no useful work, but it is needed to sustain the electromagnetic field associated with many commercial/industrial loads. Reactive Power takes up space in the distribution lines but does not show up on a simple energy or demand meter. It is measured in kVAR.

### **What is Apparent Power?**

**Answer:** Apparent power is the product of voltage and current.

### **Why is Power Factor Important?**

**Answer:** Power Factor can affect your total energy costs. Improving the Power Factor improves efficiency, often resulting in significant economic

savings. Benefits, derived from improving your Power Factor, may include: reducing energy and distribution costs; lower distribution losses in your electrical system; higher and more quality voltage regulation; and increased available capacity to serve actual working power requirements. Additionally, improved Power Factor will help motor load equipment last longer.

### **What kinds of loads contribute to poor Power Factor?**

**Answer:** If you have inductive loads, which require the use of a magnetizing current to create a magnetic field, you may have Power Factor considerations. Inductive characteristics are more pronounced in motors and transformers and are found in all homes. One of the worst offenders is a lightly loaded induction motor, often found in “cycle processes” – for example, in the operation of saws, drills, grinders – where the motors must be sized for the heaviest load. Other sources include: induction furnaces, A/C units, dryers, washing machines, refrigerators, dishwashers, welders, pool pumps, sprinkler pumps, kitchen appliances, ceiling fans, and certain fluorescent lamp ballasts.

### **How is Power Factor determined?**

**Answer:** The aforementioned sources only affect the Power Factor when they are running. KEYS measures during peak demand, whereby the meter measures the demand every 15-minutes. The meter then compares the reading to the previous 15-minute reading and then stores the highest reading, which in turn determines the Power Factor. Another way to understand how a Power Factor is arrived at is that electromagnetic fields created by the sources that contribute to the Power Factor result in high reactive power, which results in a lower Power Factor and ultimately, a higher bill for the customer because KEYS must ensure it has enough power on hand to supply your peak demand. The higher/better your Power Factor, the lower your energy bill.

### **What should my Power Factor be?**

KEYS Power Factor threshold is 90, large commercial customers should strive to have a similar or higher Power Factor to ensure lower energy bills.

### **Other ways to consider Power Factor:**

**Example 1:** Consider a child on a swing. If you push them when they are going backwards you will actually slow them down. In order to push with maximum efficiency, the motion of the swing and your push must be “in phase”. Similarly in electricity, voltage and current must be in phase for optimum performance. Equipment such as motors, ballasts and variable speed drives tend to move voltage and current out of phase with each other.

**Example 2:** Power factor is similar to the relationship of foam and liquid as in a mug of root beer. The thirst-quenching liquid is represented by the real power (watts). The foam on top is represented by the part that does not quench your thirst called reactive power (VAR). The total contents in the mug is the summation of the beer and foam (VA – Apparent power).

**How does Power Factor impact me?**

**Answer:** From a bill perspective, an improved Power Factor has the potential to lower energy bills by running equipment more efficiently. From an operational perspective, improved Power Factor helps motor-load equipment run more efficiently with less wear and tear.

**Why does KEYS care about Power Factor?**

**Answer:** Poor Power Factor is harmful to KEYS ability to provide power in that it affects overall power efficiency and adversely impacts voltage regulation. Consistent lower Power Factor requires KEYS to increase “generation output” and design/construct facilities that accommodate the apparent power that the customer requests.

**Is there a requirement for me to improve my Power Factor? And if so any deadline I need to be aware of?**

**Answer:** There is no current requirement or deadline to improve your Power Factor, however, KEYS encourages commercial customers to improve it in order to improve electrical efficiency.