

Understanding Power Factor

Power Factor is a term that applies to the supply and delivery of electric power, and it may affect your costs for electric service. Power Factor isn't easy to explain, but because of its growing significance—and because it may be a part of your electric distribution bill—we would like to help you better understand it.

What Is Power Factor?

To understand Power Factor, you first have to know that power has two components: *working and reactive power*.

Working power 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 register as kilowatt-hours on your electric meter.

Reactive power 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 kilovolt-amperes-reactive, or kVAR.

The total required capacity, including working and reactive power, is known as apparent power. It is expressed in kilovolt-amperes, or kVA. Electrical equipment, such as generators and transformers, is rated in kVA.

Power Factor is the ratio of working power to apparent power—or kW/kVAR.

Power Factor values can vary from 0 to 1.00. Typically, values range from 0.80 to 0.98. A Power Factor below 0.80 is considered low.

Why Is Power Factor Important?

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:

- Reduced energy and distribution costs
- Lower distribution losses in your electrical system
- Higher and more quality voltage regulation
- Increased available capacity to serve actual working power requirements

What Kind of Loads Contribute to Poor Power Factor?

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 more often in commercial and industrial facilities. One of the worst offenders is a lightly loaded induction motor, often found in “cycle processes”

—for example, in the operation of saws, conveyors, and grinders—where the motor must be sized for the heaviest load. Other sources include: induction furnaces, standard stamping machines, weaving machines, single stroke presses, automated machine tools, welders, and certain fluorescent lamp ballasts.

How Is Power Factor Shown on My Bill?

Power Factor is shown in the detail charges area of your distribution bill in three ways:

- Power Factor (ratio) for all voltages— xx PCT (86 PCT is an example of “xx”)
- Excess kVARs— # of Excess kVARs (0 or other measured number)
- Excess kVAR demand charge— # of Excess kVARs @ \$3.50 (the number x \$3.50)

You will always see a Power Factor ratio on your distribution bill, whether it is high or low. If your Power Factor is above 80 percent, the excess kVAR line will indicate 0, and the excess KVAR demand charge line will indicate no charge. If your Power Factor falls below 80 percent, you will see the number of excess kVARs and an excess kVAR demand charge, at \$3.50 per excess kVAR (for example: 10 Excess kVARs @\$3.50 = \$35.00).

What Can Be Done to Improve Power Factor?

The best way to improve Power Factor depends largely on the particular operating considerations involved. In some cases, motors or transformers can be sized more closely to the actual work requirement, effectively improving the Power Factor. It may be that motor idling or “no load” running periods can be reduced, producing a twofold benefit: improved Power Factor and more effective energy management.

Although there is no single “right” answer, the installation of low-cost, Power Factor correction capacitors offers one of the most effective corrective measures. Inductive (motor) loads have a negative effect on the electrical system, and Power Factor correction capacitors can be used to offset this inefficiency. You may want to check with a consulting engineer to find out whether this corrective measure could improve your efficiency.

For more information you can search the Internet using the following phrase: “electric power factor,” or call 800.477.4747.