

WHITEPAPER

What is Power Factor?

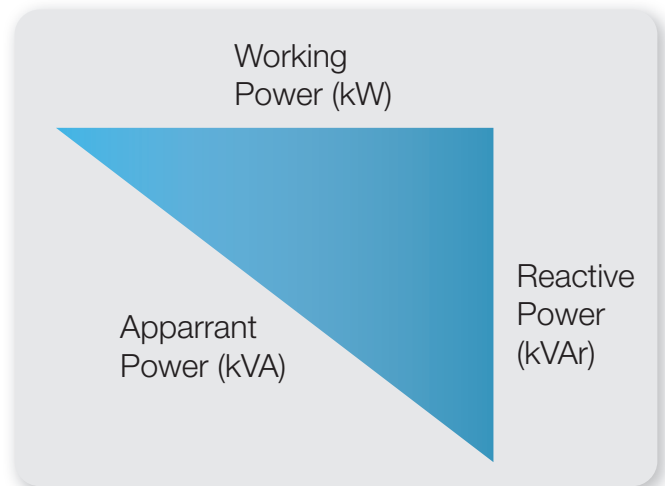


It is not always the case that the amount of electricity you receive is equivalent to the amount of electricity you use – in fact many consumers are billed on “wasted” electricity. A simple analogy can be made to the froth on a glass of beer. Although you pay for the entire glass the froth represents a wasted portion which you can’t do much with. The same can be said for the consumption of electricity – you are liable to pay for the amount supplied even if you aren’t able to utilise all of it. Power Factor is a measure of this inefficiency and Power Factor Correction is the solution used to minimise these inefficiencies.

To make things a bit more technical...

Power factor is the relationship between **Working Power** and **Reactive Power**.

Most loads are inductive and require an electromagnetic field to operate. Inductive loads require two kinds of power:



- **Working power:** Performs the actual work in creating heat, light, motion, or whatever else is required. It is measured in kilowatts (kW).
- **Reactive power:** Doesn’t do useful “work” but rather sustains the electromagnetic field. It is measured in kilovolt-amperes-reactive (kVAR).

These two types of power combine to create the **Apparent Power**. It is measured in kilovolt-amperes (kVA).

These three type of power are related though the “Power Triangle” as illustrated above.

Simple trigonometry gives us the relationship between all three Powers:

$$\text{kVA}^2 = \text{kW}^2 + \text{kVAR}^2$$

Power Factor is a measure of how effectively electrical power is being used in the conversion of current to work. The higher the Power Factor, the more effectively electrical power is utilised, conversely the lower the Power Factor the more ineffectively electrical power is utilised.

Whitepaper: What is Power Factor?

Power Factor is defined as the ratio of working power to apparent power.

$$\text{Power factor} = \frac{\text{working power}}{\text{apparrant power}} = \frac{\text{kW}}{\text{kVA}}$$

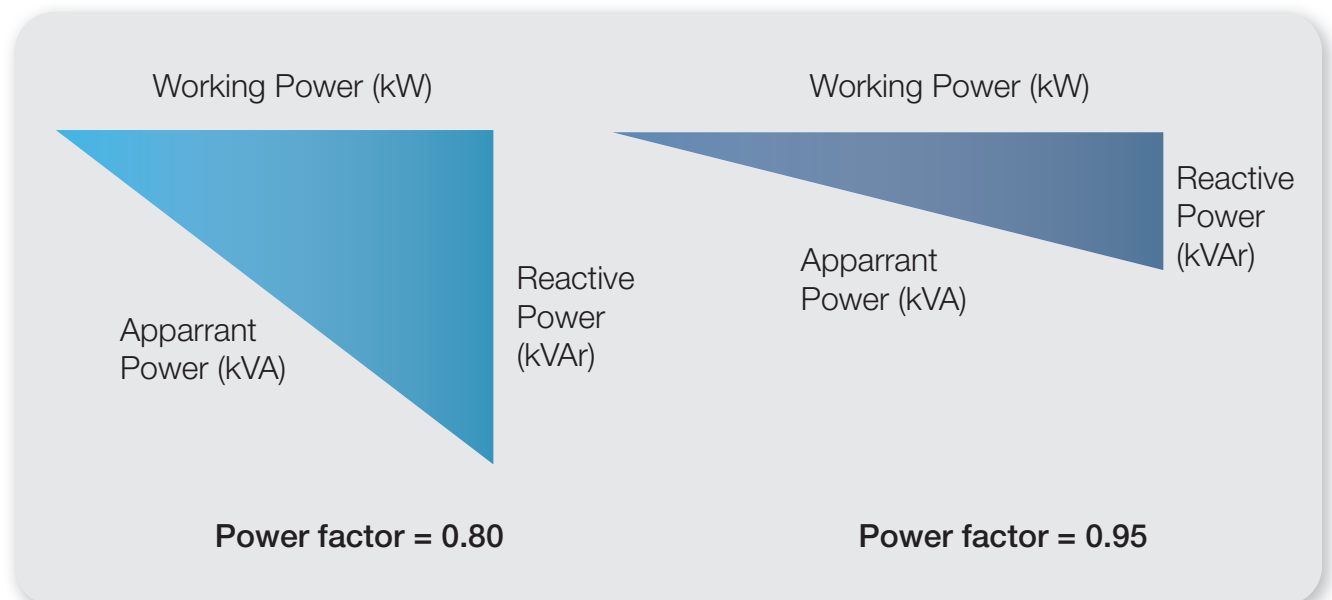
For example, if the working power is 400 kW and the apparent power is 500 kVA, the Power Factor would be 0.8 which is a relatively poor Power Factor. The closer the Power Factor is to 1, the better.

HOW CAN I IMPROVE A LOW POWER FACTOR?

The simplest way to improve Power Factor is to install a **Power Factor Correction unit** at your site.

Power factor correction units consist of capacitors which act as reactive current generators. By providing the reactive power, they reduce the total amount of power you must draw from the network.

For the same working power (kW) you can reduce the reactive power (kVAr) and the apparent power (kVA) as shown below:



HOW DOES POWER FACTOR IMPACT ME?

A poor Power Factor indicates your operations are not optimising the usage of the electrical power being supplied to the premises. If your business is billed on a kVA demand tariff then your network charges will be higher than what they would be if you increased your Power Factor. If you're billed on a kW demand tariff then improving your Power Factor will not have a financial benefit. You can tell if you're billed on kVA or kW demand tariff by looking at the top right hand corner of the first page of Energy Action's monthly reports, the "unit code" will show you how you are billed.

HOW CAN I INSTALL A POWER FACTOR CORRECTION UNIT?

Energy Action, as the providers of your Contract Management & Environmental Reporting service has the data to identify whether you can benefit from installing Power Factor Correction.

The technology is compact, reliable, safe, low in maintenance and well proven across Australia, and implemented in literally thousands of businesses in your neighbourhood