POWER FACTOR

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Power Factor

The ***current*** in a circuit consists of two main components:

(i) the ***component*** contributing to the power being absorbed.
(ii) the magnetising ***component*** (sometimes referred to as the "idle" or "wattless" current).

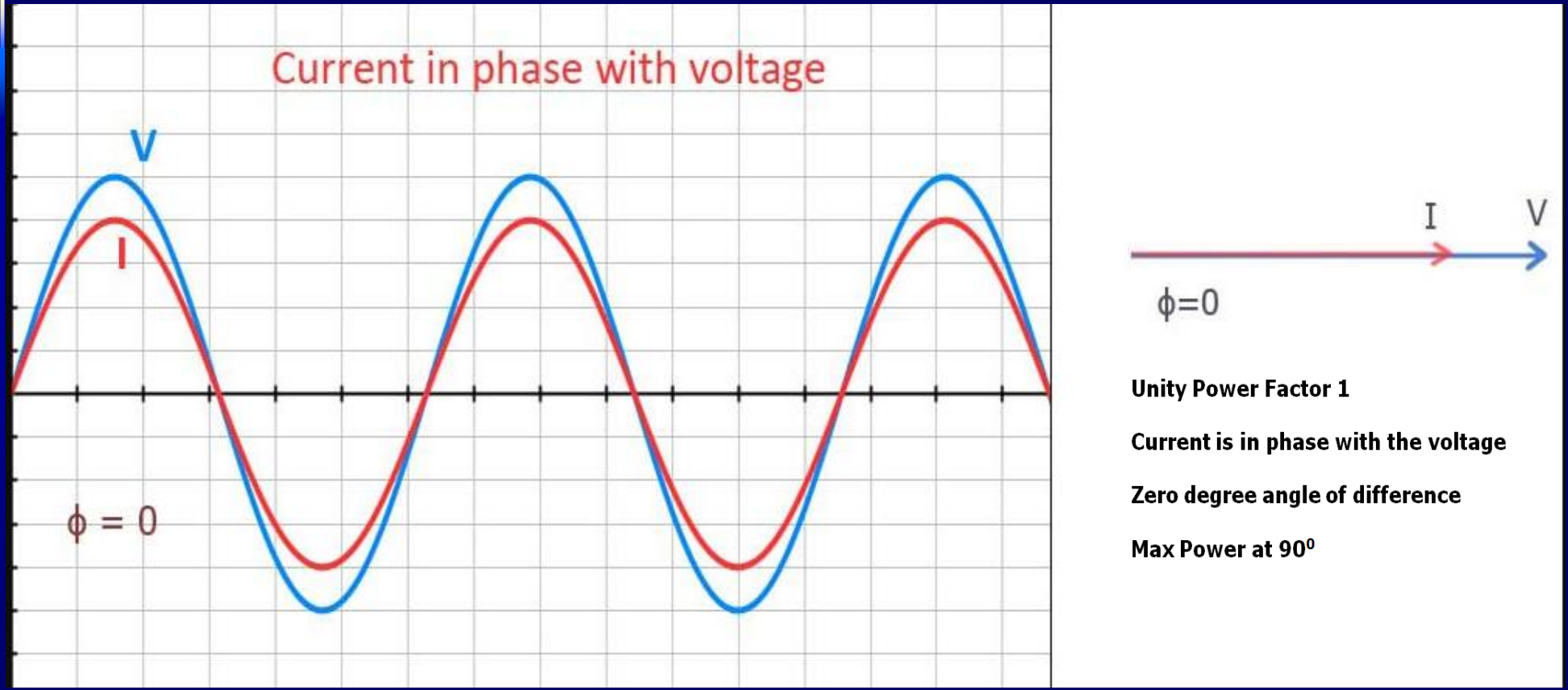
The **power factor** is the relationship between these two components and is commonly shown as:-

$$\text{Power Factor} = \frac{\text{Load in Watts (power absorbed)}}{\text{Supply voltage} \times \text{Total circuit current}}$$

Or

$$\text{Power Factor} = \frac{\text{Real Power (Watts) } \textit{Mechanical}}{\text{Apparent Power (VA) } \textit{Electrical}}$$

Unity Power Factor



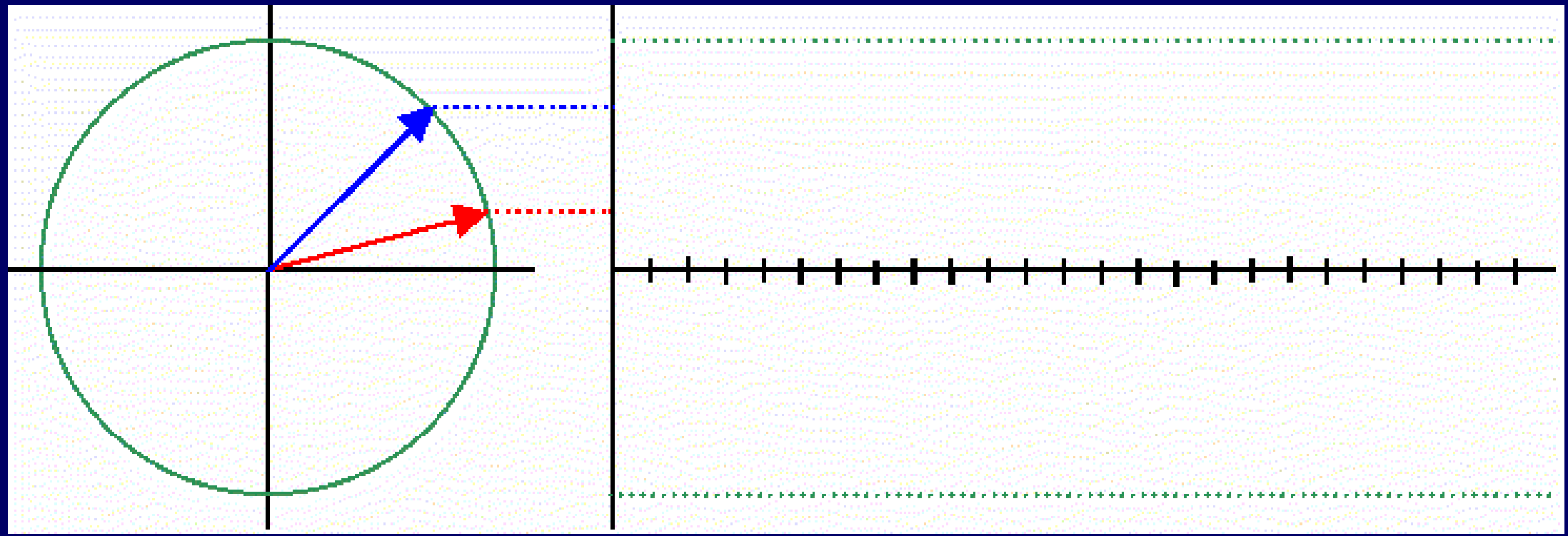
Unity Power Factor 1

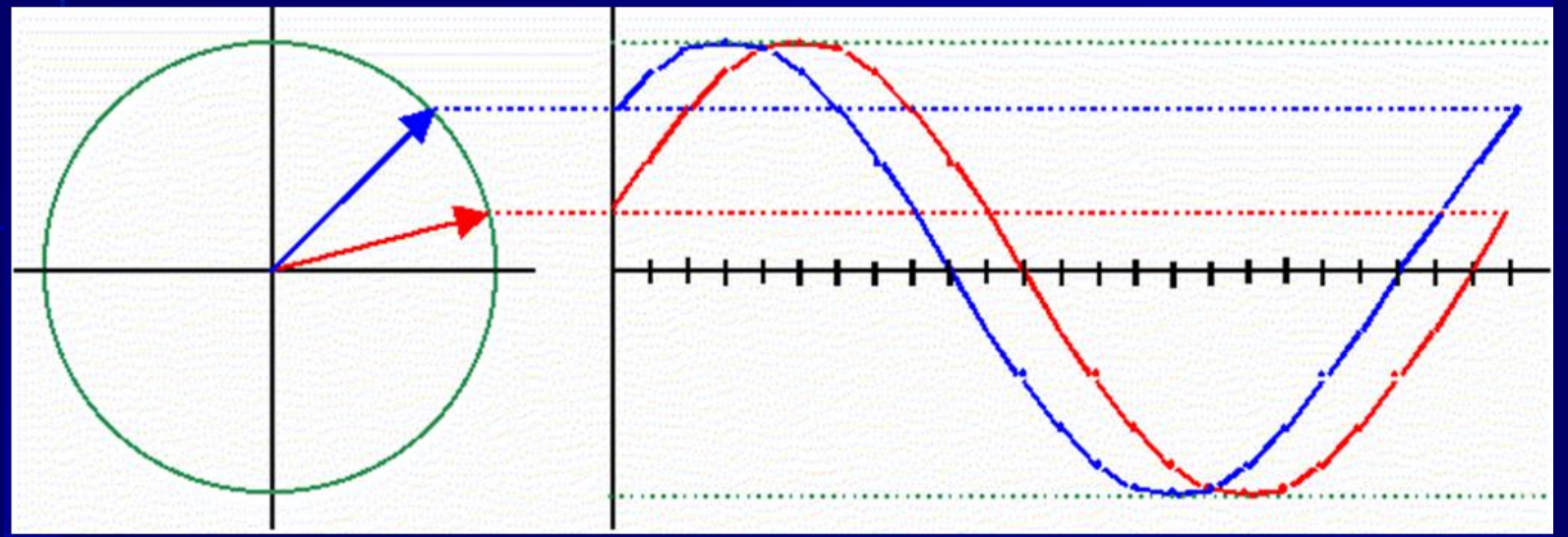
Current is in phase with the voltage

Zero degree angle of difference

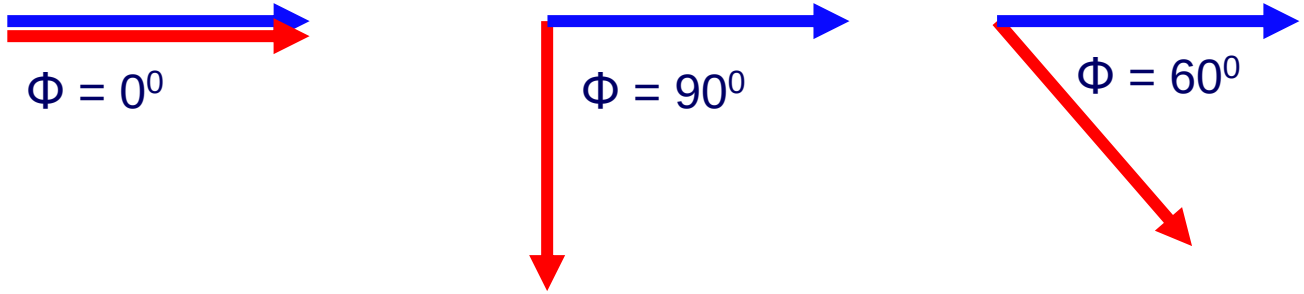
Max Power at 90^0

Lagging Power Factor



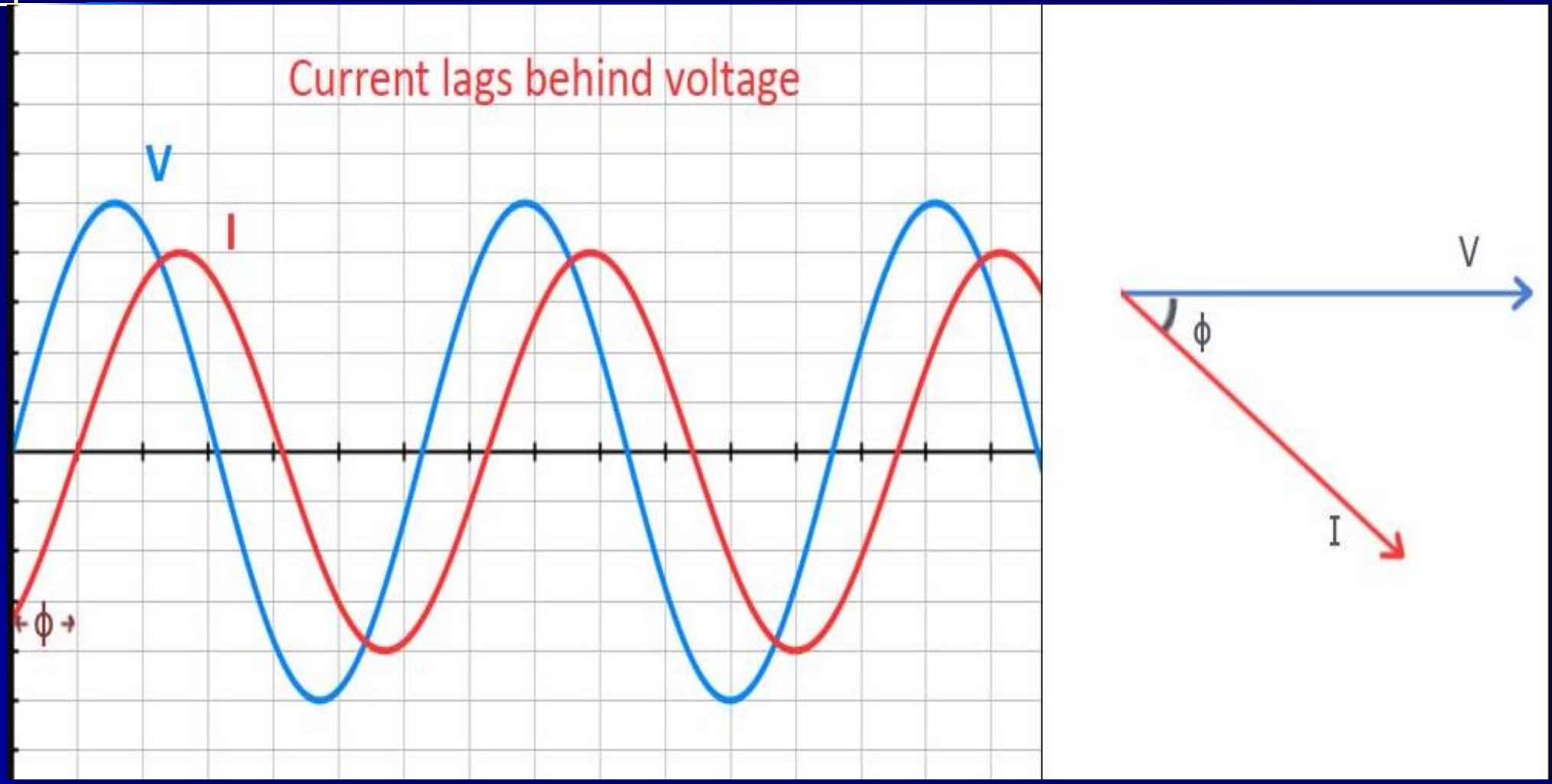


Phase Angle Φ PHI

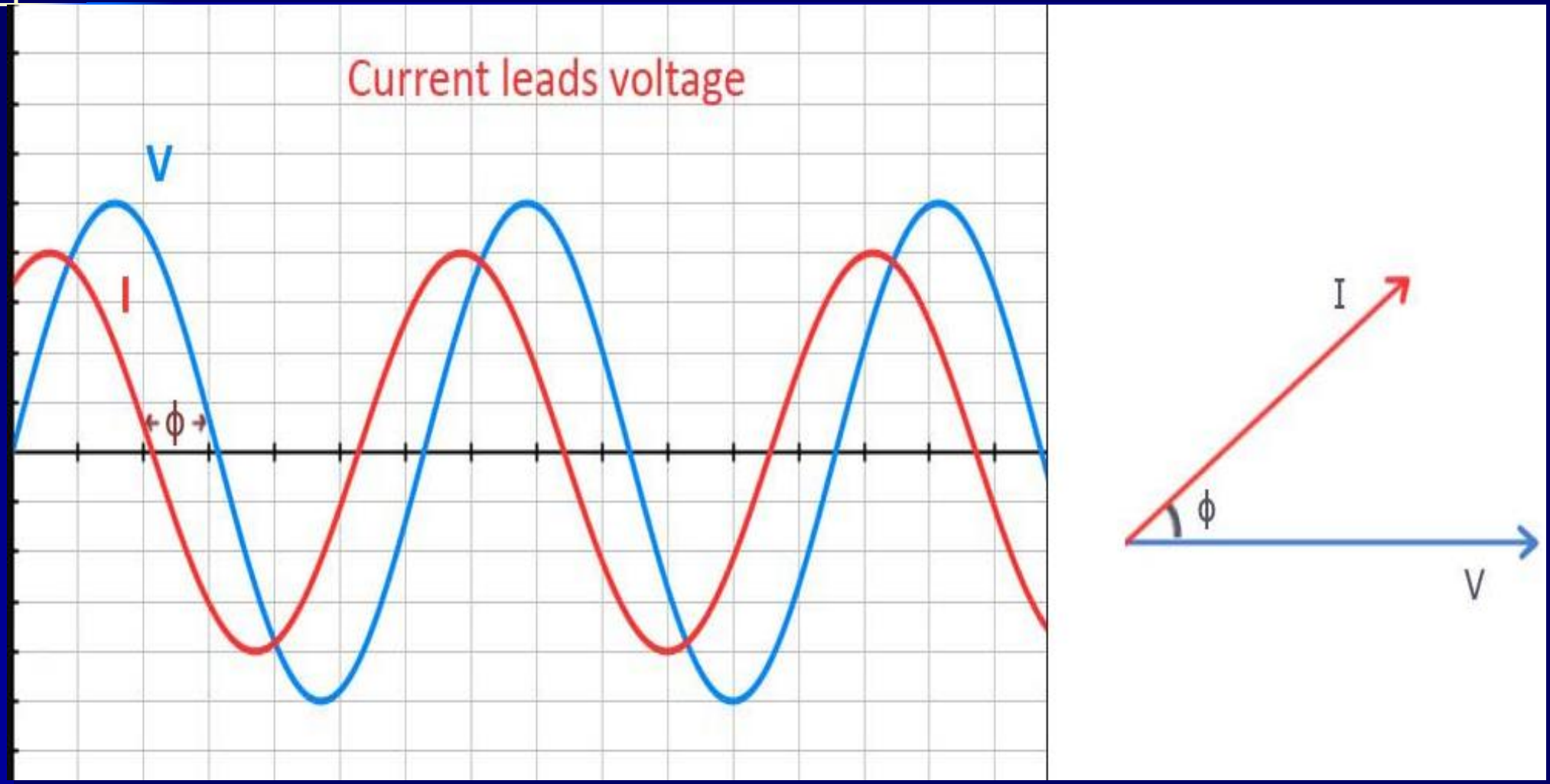


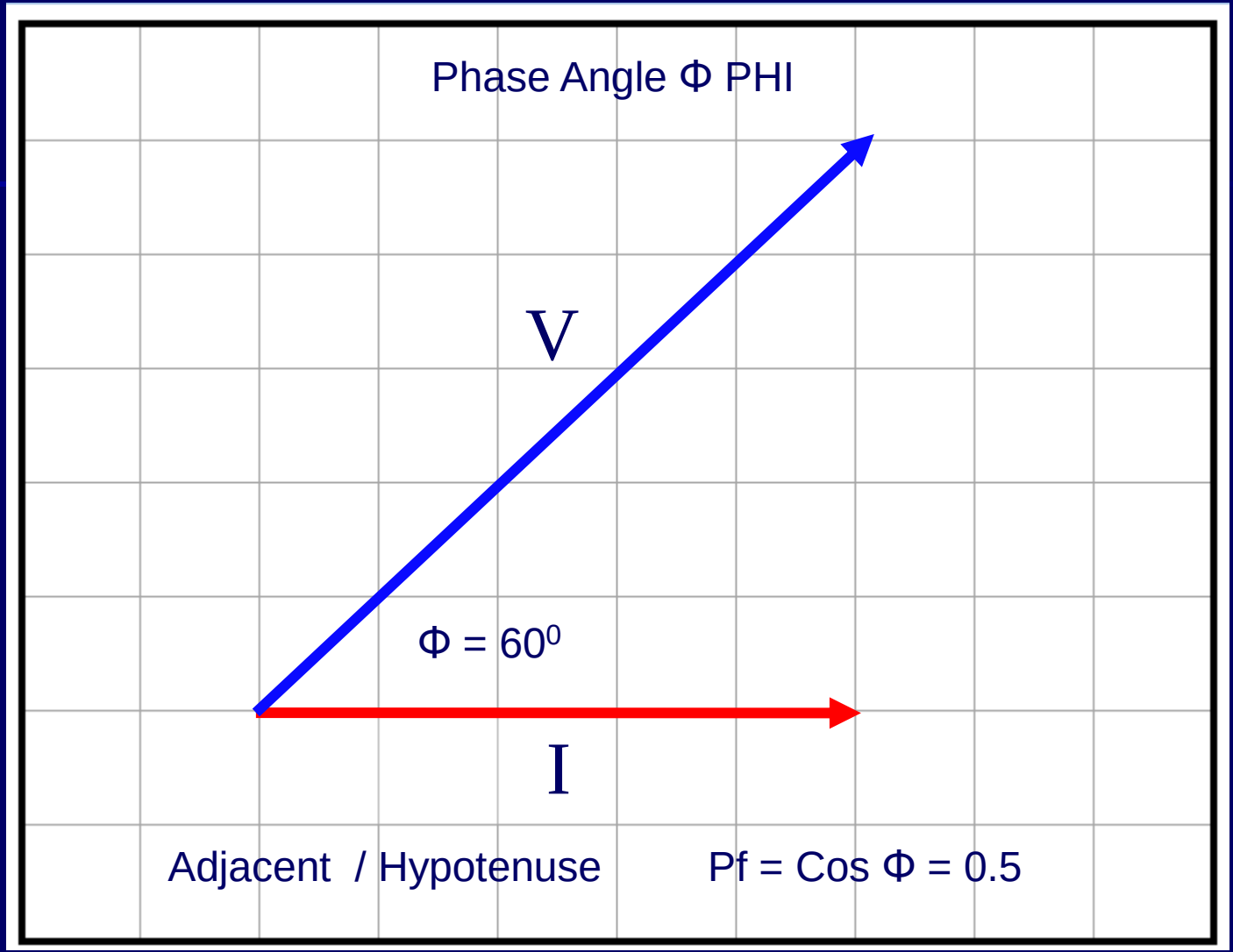
Pf = Cos Φ = 1	Pf = Cos Φ = 0	Pf = Cos Φ = 0.5
P = V x I x 1	**P = V x I x 0**	**P = V x I x 0.5**

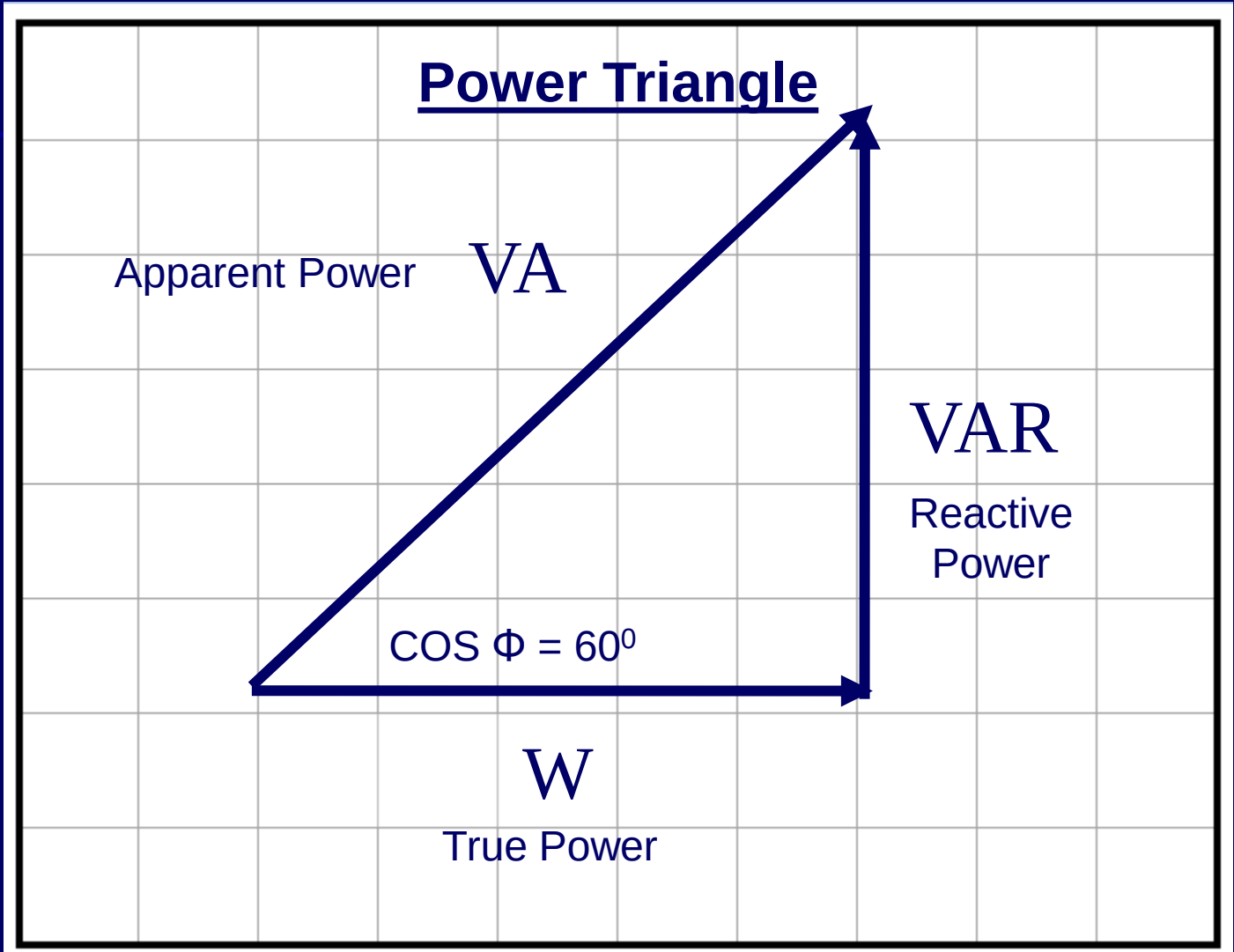
Lagging Power Factor



Leading Power Factor







Power Factor Lagging

Typically, full load power factors should be in the range 0.65 to 0.95.

A low power factor is to everyone’s' disadvantage, particularly the Supply Authority, since it limits the capacity of their generating equipment.

In order to operate at their designed output, circuits should, ideally, have a power factor of unity, or 1.

Active Power = Volt's x Amp's x Cos Φ .

Power Factor

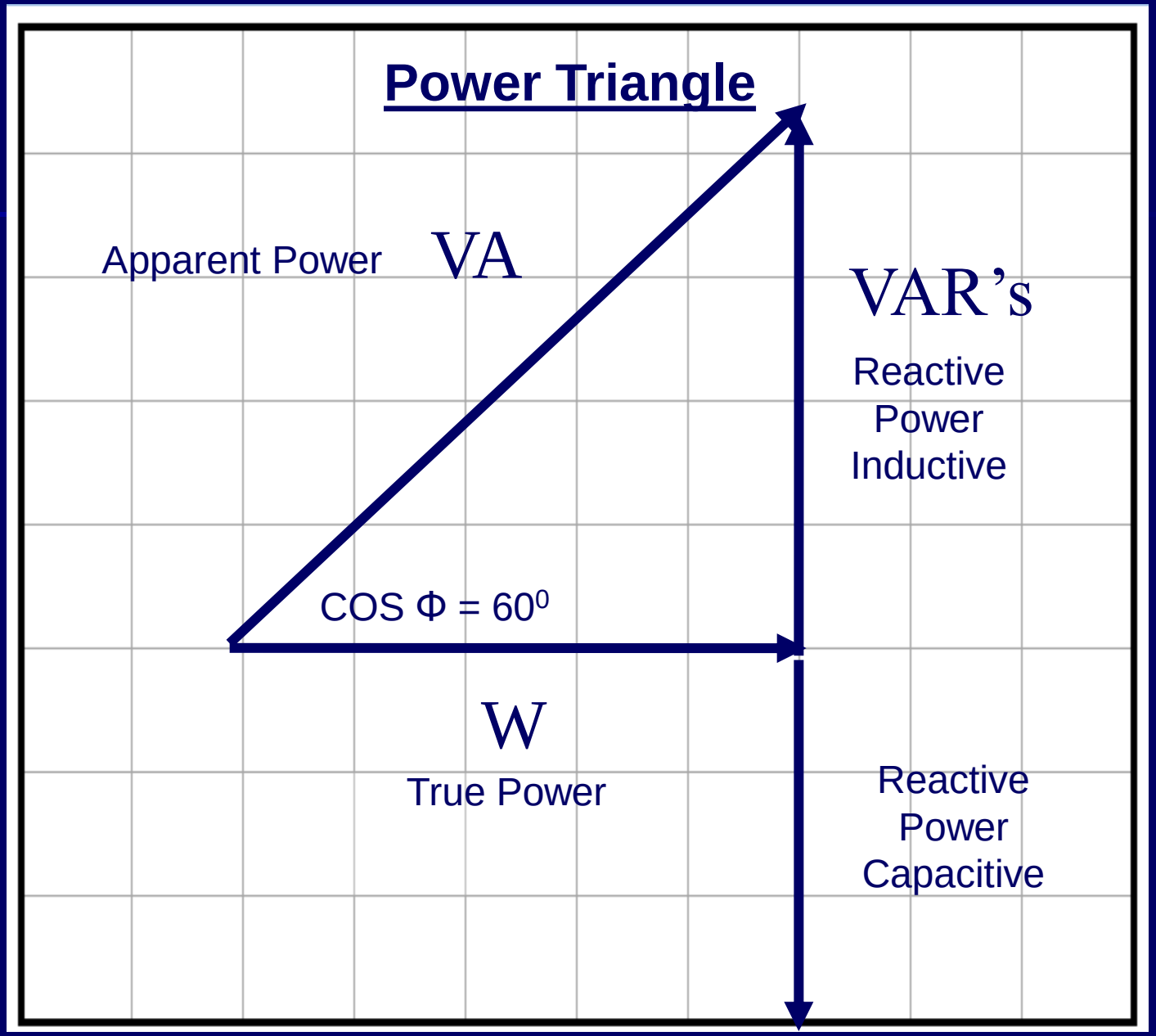
Theoretically in a purely inductive circuit the voltage will lead the current by 90^0 or vice versa the current will lag the voltage by 90^0. And in a purely capacitive circuit the voltage will lag the current by 90^0 or vice versa the current will lead the voltage by 90^0

One way to remember this is the use of the acronym CIVIL

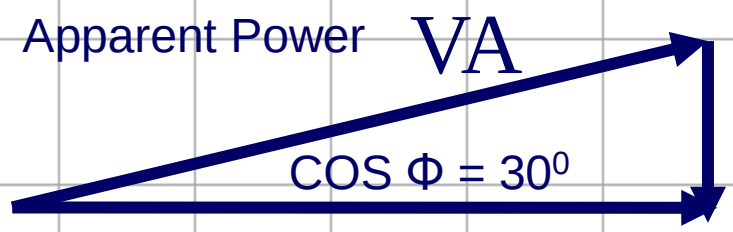
C	**I**	**V**	**I**	**L**
Capacitive	current	voltage	current	Inductive

Power Factor Correction

Power Triangle



Power Triangle



VAR's

Resultant
Reactive
Power
Inductive
Capacitive

Pf = 0.86