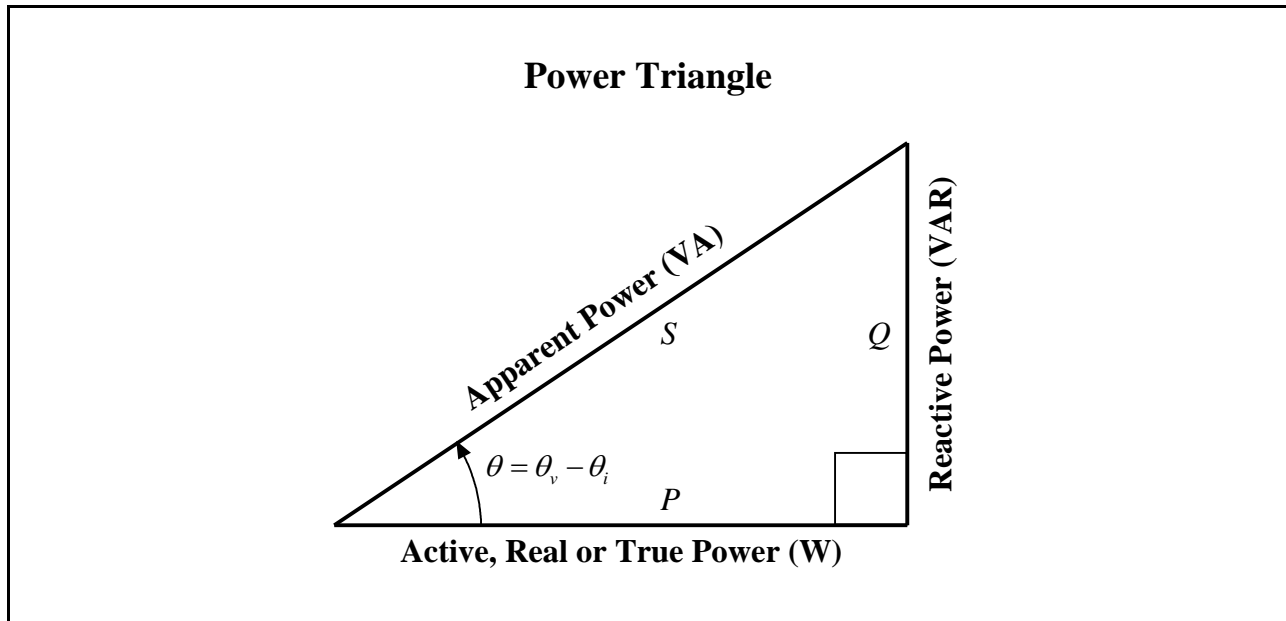


Complex Power



Complex Power
$\mathbf{S} = P + jQ = \mathbf{V}_{rms} \mathbf{I}_{rms}^* = (V_{rms} \angle \theta_v)(I_{rms} \angle -\theta_i) = V_{rms} I_{rms} \angle \theta = S \angle \theta$ (where $\theta = \theta_v - \theta_i$)
Apparent Power = $S = \mathbf{S} = V_{rms} I_{rms} = \sqrt{P^2 + Q^2}$
Real Power = $P = \text{Re}\{\mathbf{S}\} = S \cos \theta$ (where $\theta = \theta_v - \theta_i$)
Reactive Power = $Q = \text{Im}\{\mathbf{S}\} = S \sin \theta$ (where $\theta = \theta_v - \theta_i$)

Power Factor
$pf = \frac{P}{S} = \cos \theta$ (where $\theta = \theta_v - \theta_i$)
pf is lagging if current lags voltage (i.e., $0^\circ < \theta < 90^\circ$ where $\theta = \theta_v - \theta_i$)
pf is unity if $\theta = 0$ (where $\theta = \theta_v - \theta_i$)
pf is leading if current leads voltage (i.e., $-90^\circ < \theta < 0^\circ$ where $\theta = \theta_v - \theta_i$)