

Do Problems 5.43 and 5.44 in GOS

(PowerWorld Example 5-4)

Do this problem borrowed from a classic power engineering text:

3.5 A three-phase round-rotor synchronous generator, rated 16 kV and 200 MVA, has negligible losses and synchronous reactance of 1.65 per unit. It is operated on an infinite bus having a voltage of 15 kV. The internal emf E_i and the power angle δ of the machine are found to be 24 kV (line-to-line) and 27.4° , respectively.

- (a) Determine the line current and the three-phase real and reactive power being delivered to the system.
- (b) If the mechanical power input and the field current of the generator are now changed so that the line current of the machine is reduced by 25% at the power factor of (a), find the new internal emf E_i and the power angle δ .
- (c) While delivering the reduced line current of (b), the mechanical power input and the excitation are further adjusted so that the machine operates at unity power factor at its terminals. Calculate the new values of E_i and δ .
- (d) Draw a phasor diagram illustrating the different operating states.

For your fact-checking convenience: the base current for this machine should be 7.217 kA.