

Mechanical-to-Electrical Energy Conversion

11. Variable Speed Operation of Synchronous Generators

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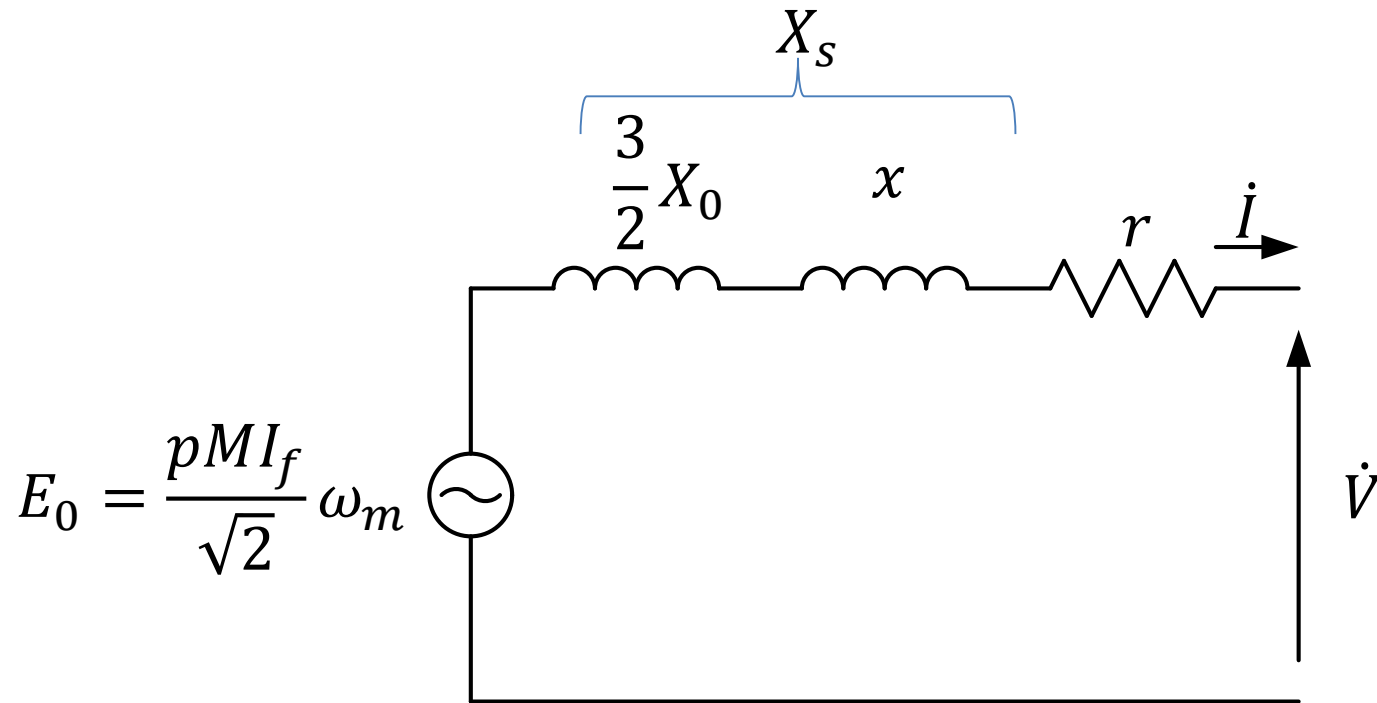


Contents of Today

1. System Configurations
2. Fundamental principles
3. Fundamental characteristics.



Single-Phase Equivalent Circuit



E_0 : No-load Electromotive Force

X_0 : Reactance of the Self Inductance

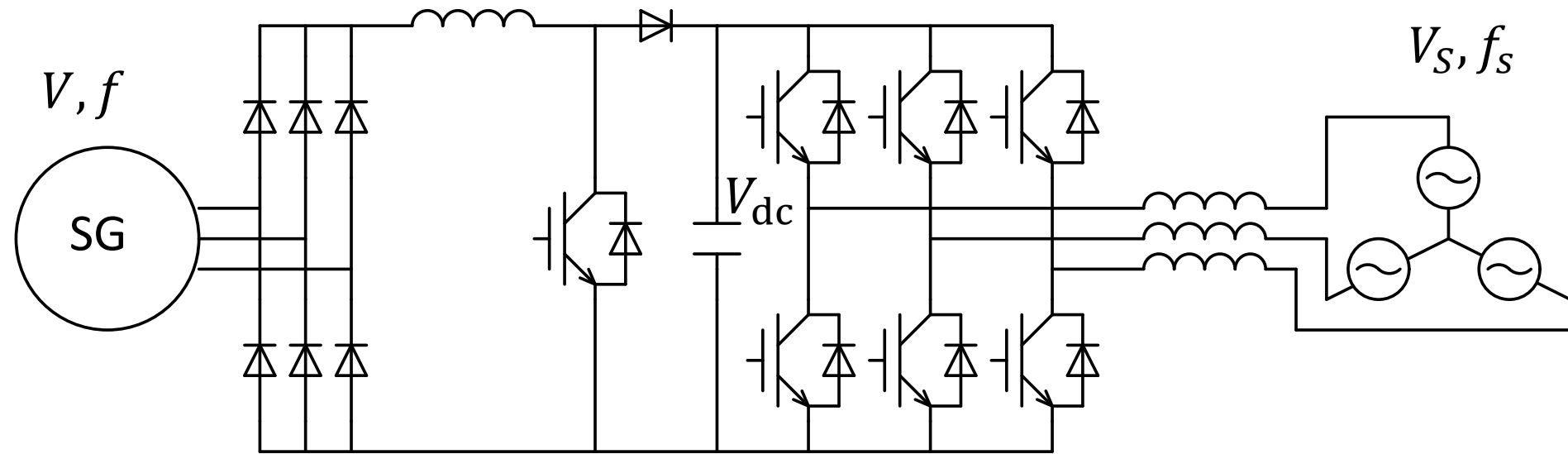
x : Leakage Reactance

r : Winding Resistance

X_s : Synchronous Reactance

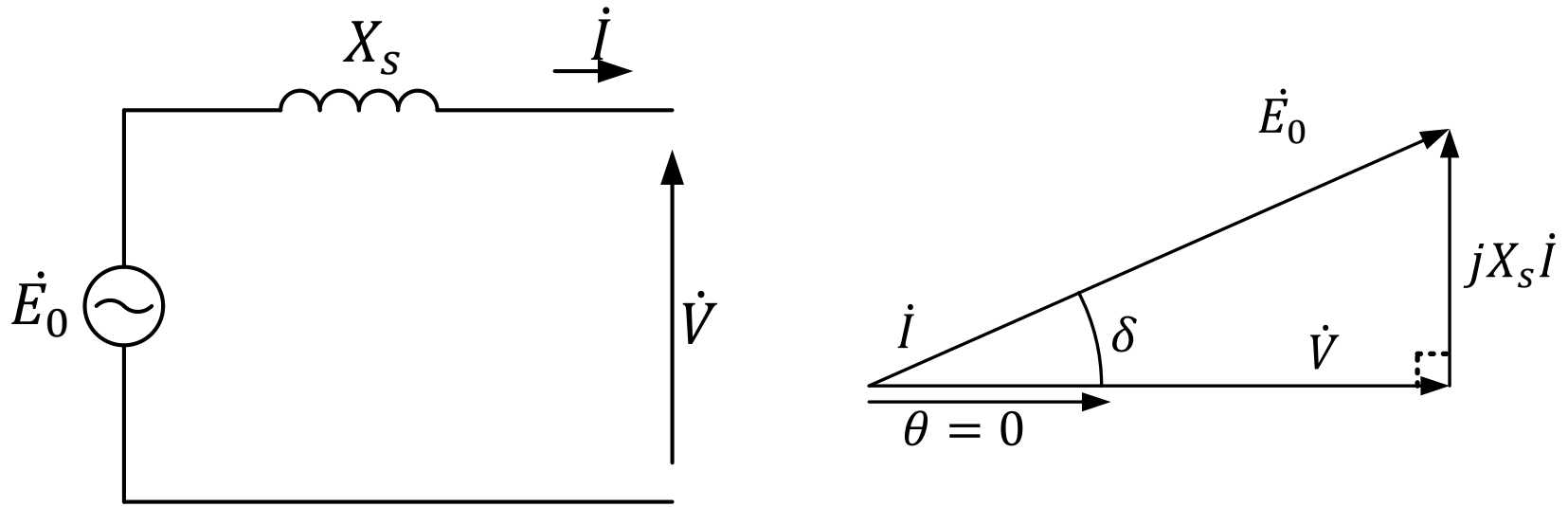


Diode Rectifier with a Boost Converter



- Diode rectifier: Unity power factor
- Boost converter: Regulation of V_{dc}

Phasor Diagram



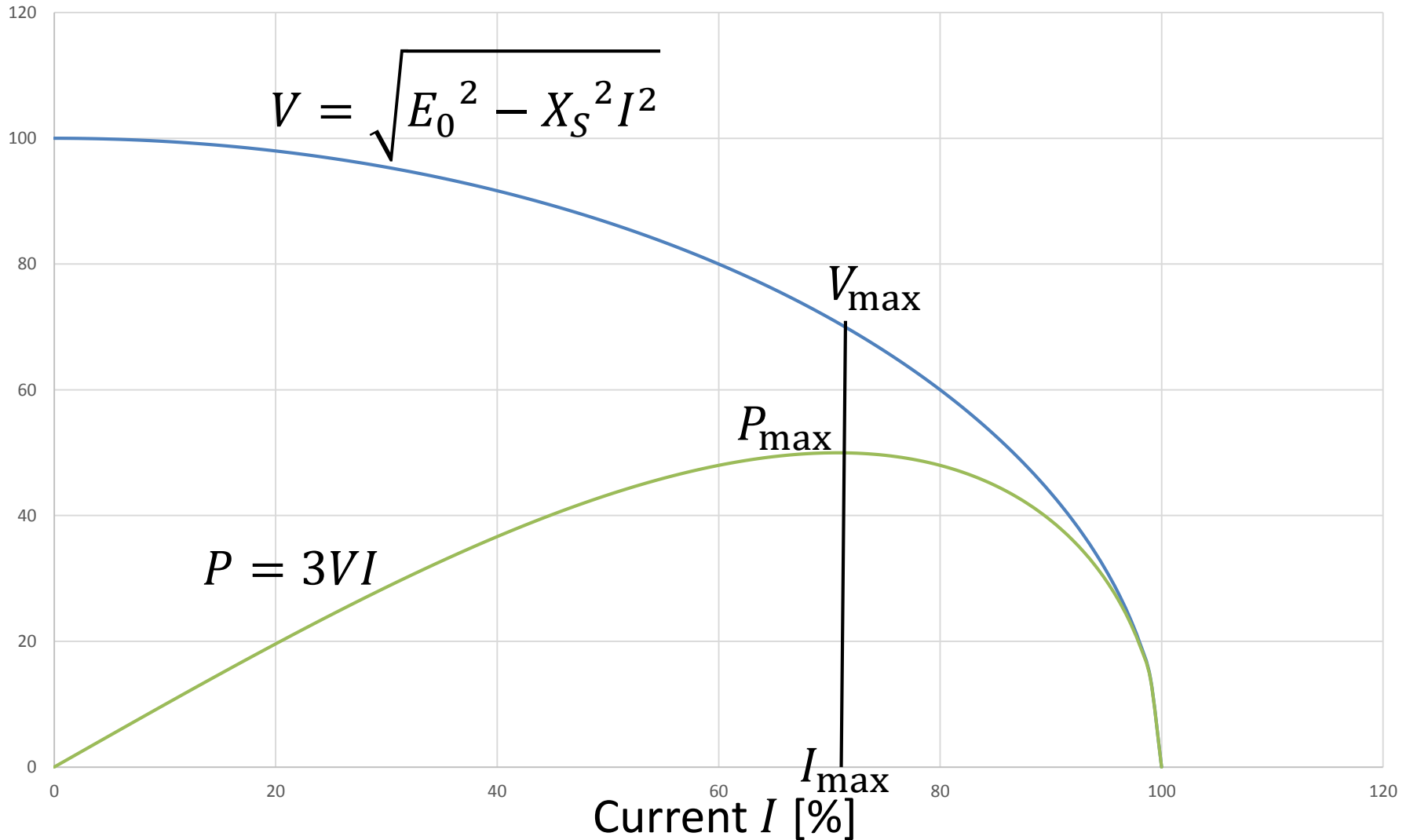
Unity Power Factor: $\theta = 0$

$$E_0^2 = V^2 + X_s^2 I^2$$

$$V = \sqrt{E_0^2 - X_s^2 I^2}$$



Voltage and Power



To be Continued in the Lecture.....