EEE 102 Basic Electrical Engineering

Lecture 5: Efficiency & Load

Parikshit Pareek

Department of Electrical Engineering, IIT Roorkee

System Efficiency or Serial Efficiency

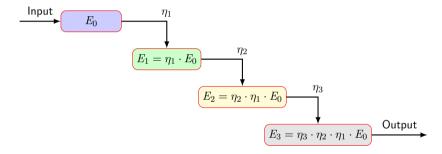
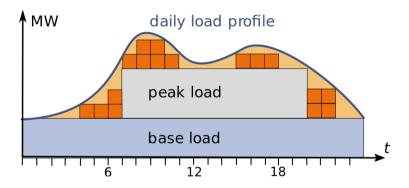


Figure: Effect of multiple conversion processes on overall conversion efficiency.

Types of Load

- ▶ Domestic Load
- ▶ Industrial Load
- Commercial Load
- Municipal Load
- ▶ Traction Load
- ► Irrigation Load

Load Curve: Base Load & Peak Load



Different power generation plants operate at various different parts of this curve.

Factors

- The factors characterize effectiveness of using power system.
 - Capacity Factor

 $\frac{\text{Annual Generation}\, MW.h}{365\, \text{Days} \times 24\, \text{Hours} \times \text{Nameplate Capacity} MW}$

Plant Utilization Factor

Maximum Demand of Power Plant
Rated Capacity of Power Plant

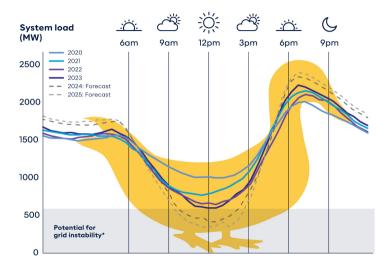
Load Factor

Average Load

Maximum Load during that Period



Duck Curve and Consequences



Safe and Clean

Question

What do you think is the SAFEST and CLEANEST source of energy?

Safe and Clean

What are the safest and cleanest sources of energy? Our World in Data Death rate from accidents and air pollution Greenhouse gas emissions Measured as deaths per terawatt-hour of electricity production. Measured in emissions of CO.-equivalents per gigawatt-hour of electricity over the lifecycle of the power plant. 1 terawatt-hour is the annual electricity consumption of 150,000 people in the EU. 1 gigawatt-hour is the annual electricity consumption of 150 people in the EU. Coal 36% of global electricity 24.6 deaths 970 tonnes 1230-times higher than solar 160-times higher than nuclear energy 18.4 deaths 720 tonnes 3% of global electricity 613-times higher than nuclear energy 65-times higher than wind -Natural Gas 2.8 deaths 440 tonnes Biomass 2% of global electricity 4.6 deaths Hydropower 24 tonnes 171.000 deaths from Ranaian Dam failure in 1975. China 12% of global electricity Wind 11 tonnes Includes deaths from Chernobyl and Fukushima disasters





Additional- Not Part of Syllabus

Want to play with some ML models¹: https://github.com/dafrie/lstm-load-forecasting

Unofficial Project

1. Develop a Python package to compare different ML architectures for load forecasting.

¹Demo project for electricity load forecasting with a Long Term Short Term Memory– a Recurrent Neural Network, with data for Switzerland