

# EE303 — Energy Systems and Power Electronics

## Lecture 24. Economic dispatch

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# Today's objectives

- **COMPREHEND** the reason for economic dispatch
- **MODEL** the generator cost rate as a function of generator output
- **FORMULATE** the economic dispatch problem as a constrained optimization problem

# econ·o·my – noun

[from Greek *oikonomia*, from *oikonomos* household manager, from *oikos* house + *nemein* to manage.]

- ① *archaic* : the management of household or private affairs and especially expenses
- ② **a**: thrifty and efficient use of material resources : frugality in expenditures; *also* : an instance or a means of economizing : saving **b**: efficient and concise use of nonmaterial resources (as effort, language, or motion)
- ③ **a**: the arrangement or mode of operation of something : organization **b**: a system especially of interaction and exchange <an economy of information>
- ④ the structure or conditions of economic life in a country, area, or period; *also* : an economic system

# dis·patch – *verb*

- 1 to send off or away with promptness or speed; *especially* : to send off on official business
- 2 **a**: to kill with quick efficiency **b** *obsolete* : deprive
- 3 to dispose of (as a task) rapidly or efficiently
- 4 defeat

## Example E3.1, p. 126

A 100 MW coal-fired plant uses a type of coal having an energy content of 12,000 BTU/lb (1 BTU = 1054.85 J). The coal cost is \$1.5/MMBTU. Typical coal usage corresponding to the daily loading schedule for the plant is as follows:

| time of day    | electric output (MW) | coal used (tons) |
|----------------|----------------------|------------------|
| 12:00am–6:00am | 40                   | 105.0            |
| 6:00am–10:00am | 70                   | 94.5             |
| 10:00am–4:00pm | 80                   | 156.0            |
| 4:00pm–12:00am | 100                  | 270.0            |

For each of the four load levels, find (a) the efficiency  $\eta$ , (b) the heat rate  $H$  (MBTU/MWhr), (c) the cost per hour,  $C$  (\$/hr). Also, for the loading levels of 40, 70, and 80 MW, use a piecewise linear plot of  $C$  vs.  $P$  to obtain incremental costs.

# Reading material

The material we covered today corresponds to:

- Module E3, pp. 122–146 of the class notes