Problem Set - 5
Economic Dispatch

1. The incremental fuel costs for two units of a plant are

$$\frac{dF_1}{dP_1} = 0.010P_1 + 11 \text{ \$/MWhr} \quad \frac{dF_2}{dP_2} = 0.012P_2 + 8 \text{ \$/MWhr}$$

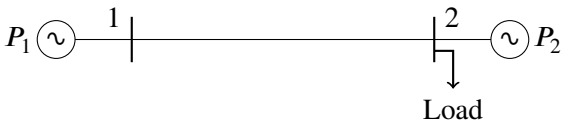
where F is in \$/hr and P is in MW. If both units operate at all times and maximum and minimum loads on each unit are 625 MW and 100 MW. Find the savings in \$/hr for economical allocation of load between the two units compared with their sharing the output equally when the total output is 750 MW. (**Ans:** 115.07 \$/hr)

2. On a system consisting of two generating units, the incremental costs in \$/MWhr with P_1 and P_2 in MW are

$$\frac{dF_1}{dP_1} = 0.008P_1 + 8 \quad \frac{dF_2}{dP_2} = 0.012P_2 + 9$$

The system is operating on economic dispatch with $P_1 = P_2 = 500$ MW and $\partial P_L/\partial P_2$=0.2. Find the penalty factor of unit 1. (**Ans:** 1.5625)

3. Consider a two-bus system. The incremental production costs of the plants are



$$\frac{dF_1}{dP_1} = 0.025P_1 + 15 \quad \frac{dF_2}{dP_2} = 0.05P_2 + 20$$

If a load of 125 MW is transmitted from plant 1 to the load, a loss of 15.625 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs. 24/MWhr. (**Ans:** 123.28 MW, 80 MW, 188.1 MW)

4. The fuel inputs to two plants are given by

$$F_1 = 0.015P_1^2 + 16P_1 + 50 \text{ Rs/hr}$$
$$F_2 = 0.025P_2^2 + 12P_2 + 30 \text{ Rs/hr}$$

The transmission loss is given by

$$P_L = P_1^2 B_{11} + 2B_{12}P_1P_2 + P_2^2 B_{22}$$

where the loss coefficients $B_{11} = 0.005$ MW^{-1}, B_{12} = -0.0012 MW^{-1} and $B_{22} = 0.002$ MW^{-1}. The load to be met is 200 MW. Determine the economic operating schedule and the corresponding cost of generation. (**Ans:** 91.97 MW, 170.9 MW, Rs. 4459.36/hr)