Mathematical Model for Electricity Distribution

Objective

Minimize the total transmission cost from power plants to cities.

$$\text{Minimize} \quad Z = \sum_{p=1}^{P} \sum_{c=1}^{C} \text{TransmissionCosts}_{pc} \cdot x_{pc} \tag{1}$$

Constraints

1. Each power plant has a limited supply capacity:

$$\sum_{c=1}^{C} x_{pc} \leq \text{Supply}_p \quad \forall p = 1, \ldots, P \tag{2}$$

2. Each city has a specific electricity demand:

$$\sum_{p=1}^{P} x_{pc} = \text{Demand}_c \quad \forall c = 1, \ldots, C \tag{3}$$

3. Electricity sent from any power plant to any city is non-negative:

$$x_{pc} \geq 0 \quad \forall p = 1, \ldots, P, \ \forall c = 1, \ldots, C \tag{4}$$

Parameters

- P: Number of power plants (constant)
- C: Number of cities (constant)
- Supply_p: Electricity supply capacity of power plant p, for $p = 1, \ldots, P$
- Demand_c: Electricity demand of city c, for $c = 1, \ldots, C$
- $\text{TransmissionCosts}_{pc}$: Transmission cost from power plant p to city c

Decision Variables

- x_{pc}: Amount of electricity transmitted from power plant p to city c