

Minimize:

$$\sum_{s \in SOURCE} Cost_s \times \sum_{t \in TIMESTEP} New\ Generation_{s,t} \times Coef_{s,t} [\$]$$

Subject to:

$$\forall s \in \text{Renewables excluding solar and hydro}, Coef_{s,t} = 1$$

$$\forall s \in \text{Base load source}, Coef_{s,t} = Coef_{s,t+1} \geq 0$$

$$\forall s \in \text{Load following source}, Coef_{s,t} \geq 0$$

$$\forall s = \text{Solar}, Coef_{s,t} = \text{Scale of solar}$$

$$\forall s \in \text{Hydro sources}, Coef_{s,t} \times Generation_{s,t} \leq \overline{Generation_s}$$

$$\forall t \in TIMESTEP, \sum_{s \in SOURCE} New\ Generation_{s,t} \times Coef_{s,t} = \sum_{s \in SOURCE} Generation_{s,t}$$

where,

Generation : Original generation data from the database

New Generation : Original generation data with solar generation replaced with our input

Scale of solar : The fraction of solar generation to be deployed over all solar potential

Minimize:

$$\sum_{b \in BUSES, t \in TIMESTEP} Discharge \times LCOS + \sum_{b \in BUSES, t \in TIMESTEP} Peaker \times LCOE [\$]$$

Subject to:

$$\forall b \in BUSES, t \in TIMESTEP, Discharge_{b,t} \leq \overline{Discharge_b}$$

$$\forall b \in BUSES, t \in TIMESTEP, Charge_{b,t} \leq \overline{Charge_b}$$

$$\forall b \in BUSES, t \in TIMESTEP, Storage_{b,t} \leq \overline{Storage_b}$$

$$\forall b \in BUSES, t \in TIMESTEP, t > 1, Storage_{b,t} = Storage_{b,t-1} + Charge_{b,t} - Discharge_{b,t}$$

$$\forall b \in BUSES, t \in TIMESTEP, Transmission_{\rightarrow b,t} \leq Generation_{b,t} + Discharge_{b,t} + Peaker_{b,t}$$

$$\forall b \in BUSES, t \in TIMESTEP,$$

$$Discharge_{b,t} + Generation_{b,t} + Peaker_{b,t} + (1 - Loss) \times Transmission_{\rightarrow b,t} \geq$$

$$Charge_{b,t} + Load_{b,t} + Transmission_{b \rightarrow t}$$