Energy Mix Commitment Optimization model

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March 17, 2022

Sets

T set of total time from [0,maxTime]- maxTime furthest out to optimize for
P set of power technology sources which we are optimizing the mix for

Parameters

l_p LCOE of deploying power technology p
e_p environmental cost associated with power technology p
$m_{p,t}$ max generating capacity for power technology p at time t
d_t demand at time t for the energy system

Decision Variables

$x_{p,t}$ generation for power technology p at time t

Optimization Model

Objective

$$\min \quad \sum_{p \in P} \sum_{t \in T} x_{p,t}(l_p + e_p) \tag{1}$$

S.t.

$$\sum_{p \in P} x_{p,t} \geq d_t \qquad \forall T \qquad (2)$$

$$x_{p,t} \leq m_{p,t} \qquad \forall P, T \qquad (3)$$

$$x_{p,t} \geq 0 \qquad \forall P, T \qquad (4)$$

$$(5)$$

Objective and Constraint Explanations

1. minimize system operating costs which are: LCOE + environmental cost
2. cumulative generation from all power technologies at every single timestep should meet or exceed demand
3. generation from each power source can't exceed its maximum available capacity at each timestep
4. generation for each power source must be non negative

When Geothermal is widely deployed in mix

If: $Geothermal_{LCOE} < (NG_{LCOE} + NG_{envCost})$ true
Geothermal will be the widely deployed tech, else NG used up to capacity and then geotherm