1. Introduction

This section details the underlying assumptions of the current model. It will be updated as model development continues. The model is a two stage stochastic model. In the first stage of the model, investments are made in the capacity of power plants. In the second stage of the model, operation decisions are made on how much to run each power plant.

Time periods: 1 Nodes: 1 Technologies: 2 Stages: 2 Stochastic: Not yet

2. Model

Indices and sets
$p = 1, \ldots, P$ index of the available technologies
$n = 1, \ldots, N$ index of the set of buses
$h = 1, \ldots, H$ index of the operating modes in the load duration curve
$t = 1, \ldots, T$ index of the periods in the model
$s = 1, \ldots, S$ index of scenarios

Parameters
a_p = forced outage rate of technology p
b = budget available for investment in new power production technology
c_p = marginal cost of power production technology p
k_p = fixed cost of technology p in USD per MW
s_p = average size of technology p
$prob_s$ = probability of each scenario (assuming discrete distribution)

Variables $x_{p,s}$ = number of each type of each technology p to build [integer variable]
$y_{p,s}$ = capacity of technology p used

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\begin{aligned}
\underset{x_{p,s}}{\text{minimize}} \quad & \sum_{p=1}^{P} k_p \cdot s_p \cdot \sum_{n=1}^{N} x_{n,p} + \sum_{s=1}^{S} \sum_{n=1}^{N} prob_{n,s} \cdot \sum_{p=1}^{P} c_p \cdot y_{n,p,s} \\
\text{subject to} \quad & \sum_{p=1}^{P} y_p = d_s \ \forall \ s \\
& \sum_{p=1}^{P} y_p \leq a_p \cdot x_p \cdot s_p \\
& \sum_{p=1}^{P} x_p \cdot k_p \cdot s_p \leq b \\
& x_p, y_p \geq 0
\end{aligned}
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