Pseudocode

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10/13/2017

Python Pumped Hydro Simulation

//imports

Pandas, numpy, matplotlib.pyplot, Defs from excel files;

//Capacities for each technology

Nuclear, Hydro, Wind, OffshoreWind, Solar;

//Constants for formulas

Efficiencies, Minimum water level, maximum water level, total storage, head, gravity, water density, volumetric flow rate, constants for calculating wind and solar;

//Initialize arrays for hydro variables

Water level, stored energy, generated energy, pumped energy;

Loop through years;

choose year data for wind speed, solar, demand;

check for nuclear outages;

calculate wind power;

calculate wind offshore power;

calculate solar power;

Loop through hourly demand allocation;

allocate nuclear;

allocate solar;

allocate wind;

allocate offshore wind;

start to allocate pumped hydro;

if Pumped Hydro Storage (PHS) is in standby (not pumping or generating)

Perform checks (TBD);

Choose to pump or generate;

otherwise continue standing by;

elif PHS is pumping

if there isn't a surplus of renewable energy generation anymore

stop pumping

enter standby

else

Perform checks (TBD)

Check if Surplus is less or more than max pumping cap for an hour

Check if res has enough space

Store min[storage left, power surplus on grid, max pump cap]

Add water to the res

Calculate new water level

else PHS is Generating

if there is a surplus of renewable energy generation now

stop generation

enter standby

else

Perform checks (TBD)

Check if demand is more or less than hourly gen cap

Check if res has enough energy stored

Output min[storage left, demand to be met, max gen cap]

Take water out of res

Calculate new water level

ADD water to res from any rainfall

End allocation of pumped hydro

(thinking this will be a function that takes in demand, and pumped hydro variables and returns the updated variables, but I was going to test it in a portion of the bigger model to see if the idea works first)

//store info for this hour

Store this hours demand allocation data;

Store this hours pumped hydro variable data; (For analysis and graphs)

End hourly demand allocation loop

End year loop

//Graphs

Create chart for generation, pumping, storage, net gen, and water levels over the years and months