Duke Energy Data Analytics PhD Fellowship

Final Submission Files – December 1st, 2022

Jethro Ssengonzi

Video File

- Ssengonzi_DukeEnergyData_Final_vid.mp4

Papers/presentations

- Ssengonzi_Paper_Sep_2022.pdf

Coding Files

Most of the computational data work for this project was done in Julia module scripts (.jl files). Post processing/graphing of data points was done in MATLAB scripts (.m files).

Julia module scripts were run in VSCode terminals by using the command "include('script_name.jl') in the initiated Julia REPL. An example of module run command would look like the following: include('Ssengonzi_CC_code.jl') -> Hit enter.

MATLAB scripts could be opened in the application and run using the "Run" button in the Editor tab.

Note: Some example output files are present in folders to show what they would look like.

Original Data Files

Navigate to the "Original_Data_Files" folder

- Temoa_settings_25c_load_curves.csv
    - Has 8760 hour demand data of the year for the 9 regions of the Open Energy Outlook (OEO)
- OEO_renewables_clusters.csv
    - This file has capacity factor data for several regions from various states of the United States over the course of 8760 hours in a year (2020)
- Generating Unit Statistical Brochure 4 2015-2019 – All Units Reporting.xlsx
    - EFORd data from this file is consolidated into the following file:
        - EFORd_reference_sheet_07_15_22.csv
- All_generators_2018.csv

    - Generator plant data from this file is consolidated into the following files:
        - All_NonVRE_and_hydro_generators_2018_abridged.csv
        - All_VRE_generators_2018_abridged.csv

<u>For singular resource capacity credit</u>

Navigate to the "Single_Resource_Files" folder

- Ssengonzi_CC_code.jl
    - Input files are:
        - EFORd_reference_sheet_07_15_22.csv
        - All_NonVRE_and_hydro_generators_2018_abridged.csv
        - OEO_renewables_clusters.csv
        - Temoa_settings_25c_load_curves.csv
        - All_VRE_generators_2018_abridged.csv
    - The amount of increments produced can be adjusted in line 1525 of Ssengonzi_CC_code.jl module. The amount of increments used to produce the figures in the published paper are as follows:
        - CA = 100
        - NW = 100
        - SW = 100
        - TX = 100
        - N_CEN = 100
        - CEN = 100
        - SE = 500
        - MID_AT = 320
        - NE = 100
    - The resolution size used to produce the figures in the published paper is 10 MW. This value can be adjusted in line 1521.
- Ssengonzi_CC_plot.m
    - Input files are the output files produced by Ssengonzi_CC_code.jl
    - This code can work with any amount of increments created by Ssengonzi_CC_code.jl. It produces tile plots for all the regions.
- Ssengonzi_CC_mean_abs_error.m
    - Input files are the output files produced by Ssengonzi_CC_code.jl
    - For this code to work, a minimum of 70 increments must be in the input files created by Ssengonzi_CC_code.jl module. At least 70 increments are needed for accurate comparison of the average capacity factor method to the capacity credit calculation.
- Ssengonzi_CC_mean_rel_error.m
    - Input files are the output files produced by Ssengonzi_CC_code.jl
    - For this code to work, a minimum of 70 increments must be in the input files created by Ssengonzi_CC_code.jl module. At least 70 increments are needed for accurate comparison of the average capacity factor method to the capacity credit calculation.

For blended resource capacity credit

Navigate to the “Blended_Resource_Files” folder

- Ssengonzi_CC_blend_code.jl
    - Input files are:
        - EFORd_reference_sheet_07_15_22.csv
        - All_NonVRE_and_hydro_generators_2018_abridged.csv
        - OEO_renewables_clusters.csv
        - Temoa_settings_25c_load_curves.csv
        - All_VRE_generators_2018_abridged.csv
    - The amount of increments produced can be adjusted in line 1439 of Ssengonzi_CC_blend_code.jl module. The amount of increments used to produce the figures in the published paper are as follows:
        - CA = 100
        - NW = 100
        - SW = 100
        - TX = 100
        - N_CEN = 100
        - CEN = 100
        - SE = 500
        - MID_AT = 320
        - NE = 100
    - The resolution size used to produce the figures in the published paper is 10 MW. This value can be adjusted in line 1435.
- Ssengonzi_CC_blend_plot_code.m
    - Input files are the output files produced by Ssengonzi_CC_blend_code.jl
    - It produces tile plots for all the regions.
    - For this code to work, a minimum of 100 increments must be in the input files created by Ssengonzi_CC_blend_code.jl module.
- Ssengonzi_CC_blend_plot_code_2.m
    - Input files are the output files produced by Ssengonzi_CC_blend_code.jl
    - This code can work with any amount of increments created by Ssengonzi_CC_code.jl module.
- Ssengonzi_CC_rel_abs_error_SW_NE.m
    - Input files are the output files produced by Ssengonzi_CC_blend_code.jl
    - Produces singular error plots for the SW and NE regions
    - For this code to work, a minimum of 100 increments must be in the input files created by Ssengonzi_CC_blend_code.jl module.
- Ssengonzi_CC_rel_abs_error.m
    - Input files are the output files produced by Ssengonzi_CC_blend_code.jl
    - Produces tile error plots for all the regions
    - For this code to work, a minimum of 100 increments must be in the input files created by Ssengonzi_CC_blend_code.jl module.

For average capacity factor estimation method

Navigate to the “Avg_Cap_Fact_Files” folder

- Ssengonzi_ACF_code.jl
    - Input files are:
        - Temoa_settings_25c_load_curves.csv
        - OEO_renewables_clusters.csv
    - This code can output values for any amount of top hours. This value can be adjusted in line 333 and then the module can be run to output files for that hour amount. If a new hour amount is desired, the value can be changed and the module will be run again to output data for that new hour amount.
    - The amount of top hours used to produce the figures in the published paper are as follows:
        - 1
        - 5
        - 10
        - 15
        - 20
        - 25
        - 30
        - 35
        - 40
        - 45
        - 50
        - 55
        - 60
        - 65
        - 70
        - 75
- Ssengonzi_ACF_NE_plot.m
    - Input files are the output files produced by Ssengonzi_ACF_NE_plot.jl