Assignment 3 Load Forecasting

Load Forecasting and EV Penetration

Background

Accurate load forecasting is essential for power system planning and operation. In this assignment, you will explore New York City's electricity demand using real-world data from NYISO, analyze forecast errors (accuracy), and examine how electric vehicle (EV) adoption could impact the grid.

Data Source

- Visit NYISO Custom Reports page and explore available datasets.
- We will be focusing on:
  - Day Head Market Load Forcast (1-hour interval)
  - Real Time Dispatch Actual Load (5-min interval)
- Preprocessed dataset: I have cleaned and combined the dataset in R. The Combined Load Forecast Actual Data file is available for you to use. If you're interested, you can access the R code to replicate or modify the dataset.

Tasks and Questions

1. Load curve and load duration curve. (1pt)

- Using Actual Load, plot the hourly load curve and load duration curve of New York City in 2024
- What do these curves reveal about NYC's electricity demand pattern?

2. Average daily load characteristics. (1pt)

Analyze and visualize the acutal load profile for:

- 366 days average load by hour of day (avearage by "Hour_of_Day")
- Weekdays vs. weekends average load by hour of day (avearage by "Hour_of_Day", organize by "Is_Weekday")
- Monthly avearge houly load (average by "Month")
- Seasonal average houly load (avearge by "Season")

3. Forecast accuracy. (1pt)

- Identifythe hour(s) and day(s) with the largest forecasting error (Actural Load - forecast)
- Analyze potential causes for these errors (e.g., extreme weather, holidays, economic actiivities)

4. EV adoption and impact on load curve. (1pt)

- Make reasonable assumptions about EV penetration in New York City,
- Analyze how EV charging would affect the load curve
- Consider different charging scenarios (e.g., overnight charging, peak-hour charging)

5. Policy incentives. (1pt)

- Should ConEdison be concerned about increased EV charging deamnds? Why or why not?
- What policies or incentives could be introduced to encourage cost-effective and grid-friendly charging behaviors (e.g., time of use rates, smart charging incentives, vehicle to grid programs)?

Further reading:

Arvind Jaggi, Senior Economist, Demand Forecasting & Analysis, Electric Vehicle Forecast Impacts (Gold Book 2021)