**PROBLEM STATEMENT**

1. **INTRODUCTION**:
   1. Company Overview:

PJM Interconnection LLC (PJM) is a regional transmission organization (RTO) in the United States. It is part of the Eastern Interconnection grid operating an electric transmission system serving all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.

The hourly power consumption data comes from PJM’s website and are in megawatts (MW).

* 1. Goal:

Develop a robust and accurate demand forecasting tool for PJM. This tool will leverage historical consumption data from PJM's website and employ advanced machine learning and statistical techniques to generate precise and reliable demand predictions. These forecasts will help PJM optimize its operational strategies, enhance grid reliability, and ensure efficient energy distribution to meet the dynamic demand patterns across its service areas.

* 1. Outputs:

Build a machine learning model to predict the hourly power consumption. Deploy the application using Streamlit Community Cloud with an intuitive UI, allowing users to input various parameters and receive demand forecasts. Ensure the code is clean, well-organized, and thoroughly documented to facilitate future maintenance and collaboration.

1. **SCOPE**:
   1. Included Features:
      1. SInce the data consists of observations recorded sequentially over time, the analysis pertains to univariate time series analysis
   2. Excluded Features: Other extraneous features are out of scope.
2. **STAKEHOLDERS**

The tool will be used by the Demand Planning Team to ensure that the adequate energy is available to meet with the customer’s energy needs

1. **DATA SOURCES**

Data Source: <https://www.kaggle.com/datasets/robikscube/hourly-energy-consumption/data?select=PJMW_hourly.csv>

Data Description

| Column Name | Description |
| --- | --- |
| Date Time | Date in which the telemetry is recorded and the granularity is at an hourly level |
| PJME\_MW | Hourly power consumption data from PJM’s website.  Units: Megawatts (MW) |

1. **ASSUMPTIONS**
   1. The energy telemetry captured is cleaned and accurate
2. **METHODOLOGY**
3. Split the data for the past 12 months into test set and build a model to predict energy consumption
4. Find trends in energy consumption around hours of the day, holidays, or long term trends
5. Understand how daily trends change depending on the time of the year. For e.g. Trends in summer are very different from the trends observed in the winter.
6. **DELIVERABLES**

Deploy the app in Streamlit Cloud with an easy to use UI such that the Demand Planners can review the upcoming energy needs. Provide an option to switch between the Holt-Winter and Prophet forecasts

1. **POTENTIAL NEXT STEPS** (to be discussed in the live session)
   1. Identify features and adopt a multivariate approach to demand forecasting using Deep Forecasting packages
   2. Long-term vision for continuous improvement and integration with other systems