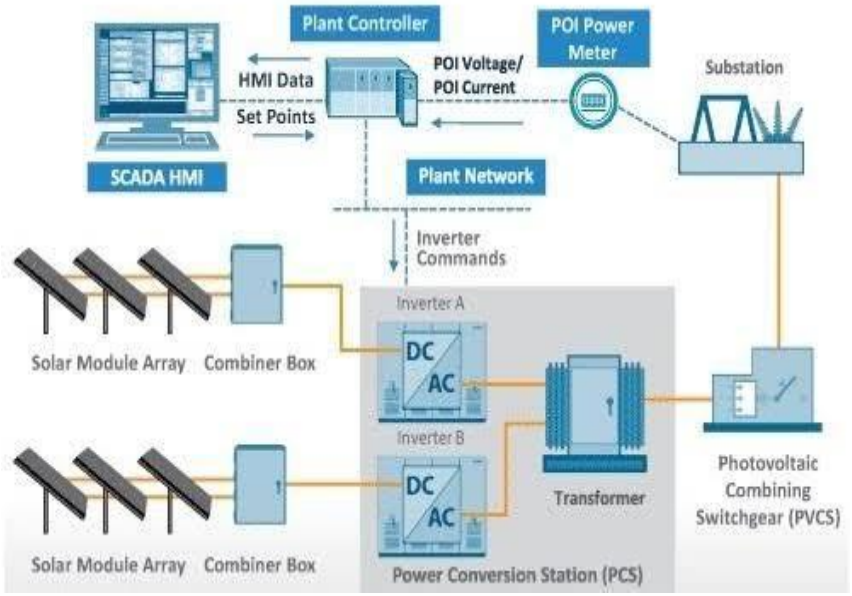
Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	03 October 2023
Team ID	8D3567C80A02B519AB14E4D188B4ABD2
Project Name	Project - xxx
Maximum Marks	4 Marks

Ab Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode



Guidelines

Data Collection:

Integrate weather APIs for real-time and historical weather data.
Collect past solar generation data from the solar panels at the specific location.
Data Preprocessing:

Clean and preprocess data, handling missing values and outliers.
Normalize or scale features to ensure consistent input for the forecasting model.
Feature Engineering:

Extract relevant features such as time of day, day of the week, and seasonal patterns.
Incorporate shading patterns, if applicable, to improve accuracy.
Model Selection:

Choose appropriate forecasting models like LSTM (Long Short-Term Memory) or ARIMA (AutoRegressive Integrated Moving Average).
Evaluate ensemble methods for enhanced accuracy.
Training and Testing:

Split the dataset into training and testing sets.
Train the model on historical data and validate its performance on a separate test set.
Real-time Integration:

Implement a mechanism for real-time data updates from weather APIs and solar panels.
Ensure seamless integration with the forecasting model to adapt to changing conditions.
Scalability and Flexibility:

Design the architecture to handle increased data volumes as the project scales.
Consider cloud-based solutions for scalability and flexibility.
Monitoring and Maintenance:

Implement monitoring tools to track model performance over time.
Schedule regular updates and retraining based on new data for model maintenance.
User Interface (Optional):

Develop a user interface for stakeholders to visualize forecasted solar generation.
Include relevant metrics and insights for better decision-making.
Documentation:

Document the entire architecture, including data sources, preprocessing steps, and model details.

Table-1 : Components & Technologies:

Component	Technology	Justification
Data Acquisition	Weather data APIs, Satellite imagery APIs	Access real-time and historical weather data from various sources
Data Preprocessing	Python, Pandas, Data cleaning libraries	Clean, prepare, and transform weather data for analysis
Feature Engineering	Meteorological expertise, Python, scikit-learn	Extract relevant features from weather data that influence solar panel power generation
Machine Learning	TensorFlow, Keras, scikit-learn	Train and optimize machine learning models for solar panel power generation forecasting
Data Storage	Train and optimize machine learning models for solar panel power generation forecasting	Store large volumes of weather data, forecasts, and model metadata

Application Characteristics:

Technique	Sampling rate	Spatial resolution	Spatial extent	Maximum Suitable Forecast horizon	Application
Persistence	High	One point	One Point	Minutes	Baseline
Whole Sky Imagery (Figure 3)	30 sec	10 to 100 meters	3-8 km radius	10s of minutes	Ramps, regulation
Geostationary satellite imagery	15 min	1 km	65°S – 65°N	5 hours	Load following
Numerical weather prediction (NWP)	1 hour	2 - 50 km	Worldwide	10 days	Unit commitment regional power prediction