Project Planning Phase
Planning Logic

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Team ID	LTVIP2026TMIDS90282
Project Name	Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management
Maximum Marks	

Planning Logic:

The planning phase of the project focuses on organizing the workflow in a structured and systematic manner. The primary objective during this stage is to ensure that each step, from data collection to model deployment, is clearly defined and logically sequenced. Proper planning minimizes errors, avoids redundancy, and ensures that the final system performs efficiently.

The first step in the planning logic is **data collection**. Historical wind turbine datasets containing wind speed, theoretical power curve values, and actual energy output are required for training the machine learning model. Reliable and structured datasets are essential because the quality of predictions directly depends on the quality of input data.

After collecting the dataset, the next step is **data cleaning**. Real-world data often contains missing values, inconsistent formats, and noise. During the cleaning process, null values are identified and handled appropriately. Column names are standardized for clarity, and data types are converted to suitable formats, such as converting date columns into datetime format.

The next phase involves **data preprocessing and processing**. This includes analyzing correlations between variables, selecting relevant features, and preparing the dataset for training. Feature selection ensures that only meaningful parameters, such as wind speed and theoretical power, are used as inputs to the model.

Once preprocessing is completed, the dataset is divided into training and testing sets. This step is crucial to evaluate the performance of the machine learning algorithm on unseen data. A proper split ensures that the model generalizes well and avoids overfitting.

After splitting the data, the selected machine learning algorithm (Random Forest Regressor) is trained on the training dataset. The model learns patterns between input features and energy output. Performance metrics such as Mean Absolute Error (MAE) and R^2 score are calculated to assess accuracy.

Finally, the trained model is saved and integrated into the Flask web application. The planning logic ensures a smooth transition from data preparation to deployment, resulting in a complete end-to-end system capable of predicting wind turbine energy output effectively.