Project Design Phase
Problem – Solution Fit

Date	12 February 2026
Team ID	LTVIP2026TMIDS90282
Project Name	Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management
Maximum Marks	

Problem – Solution Fit:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why.

The core problem addressed in this project is the difficulty in accurately predicting wind turbine energy output due to fluctuating weather conditions. Wind energy production is directly influenced by wind speed and environmental parameters, which vary continuously. Traditional estimation methods are often insufficient to capture these complex patterns.

To solve this problem, a machine learning regression approach was selected. Since the objective is to predict a continuous numerical value (energy output in kWh), regression algorithms are the most suitable category of models for this task. Regression models can identify patterns between input variables and output values efficiently.

Among various regression algorithms, the **Random Forest Regressor** was chosen as the primary model. Random Forest is an ensemble learning algorithm that builds multiple decision trees and combines their outputs to improve prediction accuracy. It reduces overfitting and performs well even when the data contains non-linear relationships.

Wind energy output does not always follow a simple linear pattern with respect to wind speed. Random Forest can handle complex, non-linear relationships effectively, making it well-suited for this application. It also performs well with moderate-sized datasets and requires minimal feature engineering.

Another reason for choosing Random Forest is its robustness to noise and outliers in the dataset. Weather data can contain irregularities or sudden fluctuations, and Random Forest is capable of maintaining stable predictions under such conditions.

Additionally, Random Forest provides better generalization compared to single decision tree models. By combining multiple trees, it reduces variance and increases overall reliability of predictions. This makes it ideal for real-world renewable energy applications.

Therefore, Random Forest Regressor was selected as the most appropriate algorithm for achieving accurate, stable, and reliable wind energy output predictions in this project.