

**Project Design Phase-II**  
**Solution Requirements (Functional & Non-functional)**

Date	15 February 2026
Team ID	LTVIP2026TMIDS62246
Project Name	Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management
Maximum Marks	4 Marks

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Input Handling	Accept wind speed, wind direction, and theoretical power as input through web form
		Validate numeric input values
FR-2	Energy Prediction	Load trained Random Forest model (.sav file)
		Generate energy output prediction based on user inputs
FR-3	Output Display	Display predicted energy output clearly on UI
		Show result without page crash or delay
FR-4	Model Evaluation	Calculate R <sup>2</sup> , MAE, MSE, RMSE metrics
		Generate scatter plot of actual vs predicted values
FR-5	Data Processing	Preprocess dataset (handle missing values, rename columns), Split dataset into train and test sets (80/20)

**Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The web interface must be simple, intuitive, and easy to use for energy managers.
NFR-2	Security	The application should validate inputs to prevent invalid or malicious data entries.
NFR-3	Reliability	The system must generate consistent predictions without runtime errors.
NFR-4	Performance	The prediction response time should be less than 3 seconds.
NFR-5	Availability	The system should be accessible whenever the Flask server is running.
NFR-6	Scalability	The system should allow future integration of APIs or cloud deployment.