

Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	12 February 2026
Team ID	LTVIP2026TMIDS83348
Project Name	Weather Based Prediction Of Wind Turbine Energy Output - A Next Generation Approach To Renewable Energy Management
Maximum Marks	4 Marks

Technical Architecture

Architecture includes UI, Flask backend, preprocessing pipeline, ML model interface, data storage, and optional external APIs. Deployment can be Local initially with cloud-ready design.

Technical Architecture: Weather Based Wind Energy Prediction System

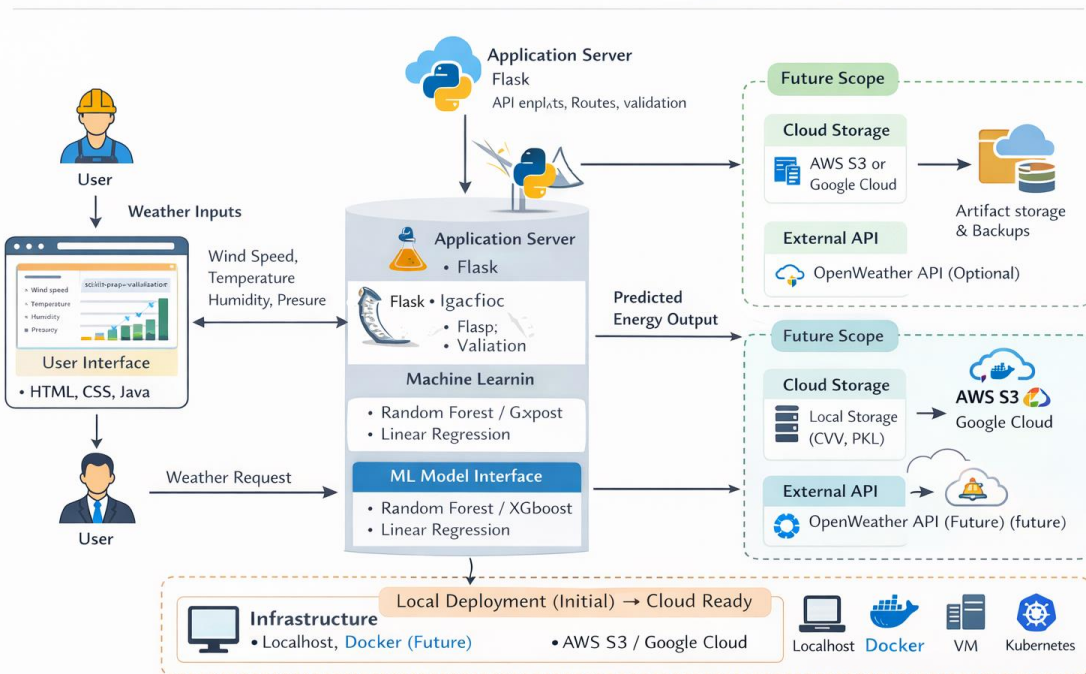


Table-1: Components & Technologies

S.No	Component	Description	Technology
1	User Interface	Weather parameter input & predicted energy visualization (Web UI)	HTML, CSS, JavaScript
2	Application Logic	API endpoints,	Python (Flask)

		routing, validation, prediction handling	
3	Preprocessing	Missing value handling, feature engineering, scaling, normalization	scikit-learn, pandas, NumPy
4	Machine Learning Model	Wind turbine energy output prediction	Random Forest / XGBoost / Linear Regression
5	Database / Storage	Weather dataset, turbine output data, trained model artifacts	Local File System (CSV, PKL)
6	Cloud Storage (Future)	Backup of datasets & trained model artifacts	AWS S3 / Google Cloud Storage (Future)
7	External API (Future)	Real-time weather data integration	OpenWeather API (Optional)

Table-2: Application Characteristics

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Open-source stack for ML and web development	Flask, scikit-learn, pandas, NumPy
2	Security Implementations	Input validation, safe model deserialization, admin access control	Flask validation, environment configs
3	Scalable Architecture	Modular layered design (UI, Backend, ML, Storage)	3-Tier Architecture, Docker/K8s (Future)
4	Availability	Local uptime initially; scalable cloud hosting later	Cloud VM, Load Balancer (Future)
5	Performance	Low-latency ML inference for real-time prediction	Optimized preprocessing pipeline