Project Initialization and Planning Phase

Date	15 March 2024
Team ID	Team-740063
Project Title	Predicting the energy output of wind turbine based on weather condition
Maximum Marks	3 Marks

Project Proposal (Proposed Solution) template

This project proposal outlines a solution to address a specific problem. With a clear objective, defined scope, and a concise problem statement, the proposed solution details the approach, key features, and resource requirements, including hardware, software, and personnel.

Project Overview	
Objective	Wind power generation differs from conventional thermal generation due to the stochastic nature of wind. Thus wind power forecasting plays a key role in dealing with the challenges of balancing supply and demand in any electricity system, given the uncertainty associated with the wind farm power output. Accurate wind power forecasting reduces the need for additional balancing energy and reserve power to integrate wind power. For a wind farm that converts wind energy into electricity power, a real-time prediction system of the output power is significant. In this guided project, a prediction system is developed with a method of combining statistical models and physical models. In this system, the inlet condition of the wind farm is forecasted by the auto regressive model.
Scope	Accurately predict the energy output of a wind turbine based on real-time and forecasted weather conditions.
Problem Statement	
Description	The energy output of wind turbines fluctuates significantly due to variations in weather conditions such as wind speed, wind direction, temperature, air pressure, and humidity. Current methods for predicting wind turbine energy output are often limited in their accuracy and responsiveness to real-time weather changes. This unpredictability poses challenges for grid operators, wind farm managers, and energy market participants in terms of planning, scheduling, and maximizing the use of wind resources.

Impact	➢ Identify key weather variables affecting turbine performance. ➢ Improve operational efficiency and maintenance scheduling. ➢ Enhance understanding of the relationship between weather patterns and energy production.
Proposed Solution	
Approach	1. Data Collection 2. Data Preprocessing 3. Model Development 4. Model Evaluation 5. Deployment
Key Features	1. Variable wind speed and direction 2. Past and Real-Time Data

Resource Requirements

Resource Type	**Description**	**Specification/Allocation**
Hardware		
Computing Resources	CPU/GPU specifications, number of cores	2 x NVIDIA V100 GPUs
Memory	RAM specifications	8 GB
Storage	Disk space for data, models, and logs	1 TB SSD
Software		
Frameworks	Python frameworks	Flask
Libraries	Additional libraries	Sklearn Pandas Numpy Seaborn Matplotlib
Development Environment	IDE, version control	VSCode
Data		
Data	Source, size, format	Kaggle dataset, 4,446records