

## **Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management**

DATE	28-02-2026
TEAM ID	LTVIP2026TMIDS90651
PROJECT NAME	Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management
MAXIMUM MARKS	2 MARKS

### **Chapter-2**

#### **Indentation Phase**

##### **2.1 - Problem Statement:**

The increasing global demand for clean and sustainable energy has led to rapid growth in wind power generation. Wind energy is one of the most promising renewable energy sources; however, its output is highly variable and depends strongly on weather conditions such as wind speed, wind direction, temperature, air pressure, and humidity. This variability makes it difficult for power grid operators and energy planners to accurately predict the amount of energy that will be generated at any given time.

Traditional methods of estimating wind turbine power output often rely on simplified models or fixed power curves, which do not fully capture the complex and dynamic relationship between weather parameters and actual energy production. As a result, these methods can lead to inaccurate forecasts, inefficient energy management, poor load balancing, and increased operational costs.

Inaccurate prediction of wind energy output also affects grid stability, scheduling of backup power sources, and overall reliability of renewable energy integration into the power system. With the growing penetration of wind energy in modern power grids, there is a strong need for a more intelligent, data-driven, and accurate prediction system.

Therefore, the problem addressed in this project is the development of a weather-based predictive model that can accurately estimate wind turbine energy output using historical weather and turbine performance data. The goal is to improve forecasting accuracy, support better decision-making in energy management, and enhance the efficiency and reliability of wind power generation systems.