**Project Design Phase-I**

**Proposed Solution**

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| Date | 24 September 2022 |
| Team ID | PNT2022TMID23131 |
| Project Name | Predicting the energy output of wind turbine based on weather condition |
| Maximum Marks | 2 Marks |

**PROBLEM STATEMENT:**

Wind energy plays an increasing role in the supply of energy world-wide. The energy output of a wind farm is highly dependent on the weather conditions present at its site. If the output can be predicted more accurately, energy suppliers can coordinate the collaborative production of different energy sources more efficiently to avoid costly overproduction. In this paper, we predict energy prediction based on weather data and analyse the important parameters as well as their correlation on the energy output.

**SOLUTION DESCRIPTION:**

Our aim is to map weather data to energy production. We wish to show that even data that is publicly available for weather stations close to wind farms can be used to give a good prediction of the energy output. Furthermore, we examine the impact of different weather conditions on the energy output of wind farms. We are building an IBM Watson AutoAI Machine Learning technique to predict the energy output of wind turbine. The model is deployed on IBM cloud to get scoring end point which can be used as API in mobile app or web app building. We are developing a web application which is built using node red service. We make use of the scoring end point to give user input values to the deployed model. The model prediction is then showcased on User Interface to predict the energy output of wind turbine

**FEASIBILITY OF IDEA:**

Feasibility analysis provides with enough information to make reasonable estimations concerning the project cost as well as indications on how the new built project will respond to user’s specific requirements.

i)**The feasibility analysis** is focused on the most promising prototype that should be efficient and affordable taking in consideration the followings:

ii)**For the technical feasibility part** Python, Python for data analysis are used to extract the data based on weather condition.

iii)**For Operational Feasibility** - This project will be quite easy and simple to operate. Therefore, no special training should be given to technical team working in wind farm.

**NOVELTY OF THE STUDY:**

Wind energy is a **source of renewable energy**. It does not contaminate, it is inexhaustible and reduces the use of fossil fuels, which are the origin of greenhouse gasses that cause global warming. Wind being a precious resource must be utilized efficiently. As aimed, through this work, we can measure the suitable conditions for more efficient power output of turbine by using applied data science.

**SOCIAL IMPACT:**

In the wind industry, it is important to assess a turbine sys-

tems response under different wind proﬁles. For instance, a

wind-to-power relationship is crucial for wind power forecast,

and a wind-to-stress relationship is important for selecting criti-

cal design parameters meeting the reliability requirement. Given

the complexity involved in a turbine system, it is impossible

to write a neat, analytical expression to underlie the above-

mentioned relationships. Almost invariably does the wind indus-

try resort to data driven methods for a solution, namely that wind

data and the corresponding turbine response data (bending mo-

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In the wind industry, it is important to assess a turbine systems response under different wind profiles. For instance, a wind-to-power relationship is crucial for wind power forecast, and a wind-to-stress relationship is important for selecting critical design parameters meeting the reliability requirement. Given the complexity involved in a turbine system, it is impossible to write a neat, analytical expression to underlie the abovementioned relationships. Almost invariably does the wind industry resort to data driven methods for a solution, namely that wind data and the corresponding turbine response data (bending moments or power outputs) are used together to fit empirically the functional relationship of interest

**BUSINESS MODEL/REVENUE MODEL:**

The issue of unpredictability of renewable energy can be dealt by advancing the weather and generation forecasting technologies, ie, the management of reserves that stand prepared to deliver surplus power when produced RE falls less than the prediction, and the availability of dispatchable load to "soak up" excess power when RE generation produces more energy than predicted.

**SCALABILITY:**

Energy trading in liberalized markets is particularly interesting from the perspective of wind energy producers because of the non-dispatchable nature of wind. This means that wind energy producers need to order to place their bids. This fundamental issue at hand is that over or under predicting the wind power generation will lead to balancing costs that result in penalties for the energy producer. This means that better forecasting can directly translate to economical savings.