



DESIGN OF A WIND POWER SYSTEM TO SUPPLY THE LOAD AT KFUPM BEACH



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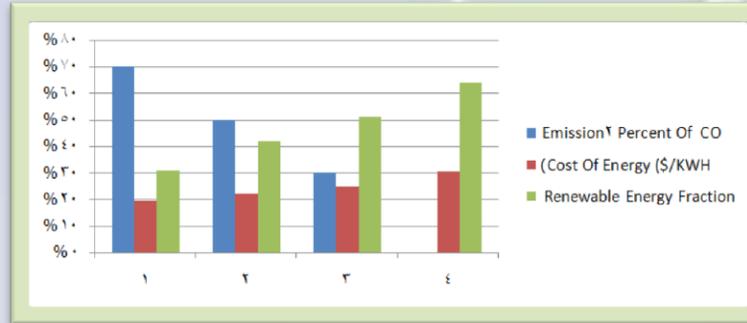


1. Objectives

It is required to design a grid-connected wind power system to supply the load at KFUPM beach. The main goal is to show the reliability of the wind power against the normal one in the Kingdom. This may give a general view about how efficient the renewable energy in our kingdom. In addition to that, renewable energy helps to reduce CO2 emission to the atmosphere.

3. Pre-Design Studies

The hourly KFUPM beach load consumption is calculated based on logic and expectation. The calculation is done for weekdays and weekends during summer and winter months. Also, the average speed among a year in Dhahran is 3.71887 m/s. The minimum speed is around .5 m/s and the maximum speed is 11.5 m/s.

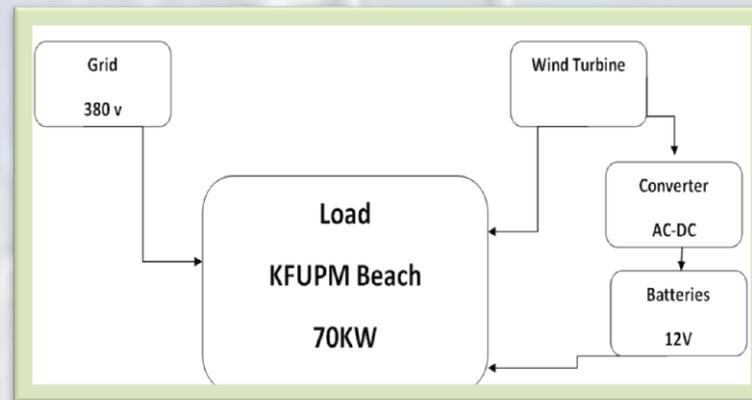


2. Economical Analysis

Case 1: Co2 emission: The total CO₂ emission of the load in one year is $19.6 * 8760 * 0.45 = 77264$ kg per year.

30% , 50% , 70% and 100% of CO₂ Reduction are taken in account.

Case 2: Grid Cost Variation: increasing 20% , 50% and 70% of 1kwh cost.



4. Wind Power System Design

Wind Turbine: the wind turbine used is CF15e. The rated power is 15KW. The cut-in speed is 1.5m/s and the rated speed is 8m/s. The number of turbines used in this project is 6 turbines.

Battery Design: Emergency load is 10.6KW which equals 42.4KW for four hours. The chosen batteries are 12VDC and 7066 Ah.

Converter Design: . It converts the power from AC to DC in case of charging and DC to AC in discharging. The converter size is 11 KW.

Grid Connection: The wind turbines are connected to the grid at low voltage 380V. Power plants in KSA use combined-cycle gas. CO₂ emission is 0.45 Kg per 1 KWH.