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Hybrid Power Generation System Using Solar -Wind Energy: A Review

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ABSTRACT

All traditional energy resources are decreasing day by day. That's why we have to change from conventional to non-conventional energy resources. The most popular renewable energy technology is the Hybrid Power System. This system involves the integration of two energy systems which will provide continuous power. Solar panels are used for converting solar energy and wind power turbines are used to convert wind energy into electricity. From the voltage panel of the wind energy conversion system and photovoltaic panels, these DC voltages are separated separately from the DC voltages, connected to the freely controlled and common DC bus and from there it is inverted. The goal of the proposed strategy is to meet the demand of the required electricity, with an added advantage of smoothing those differences of renewable powers without using energy storage.

Keywords: *Hybrid Power system, solar energy, wind energy, wind turbine, solar panel, photovoltaic panels etc*

INTRODUCTION

Renewable energy sources provides clean energy which is present in a sufficient amount on the earth. These renewable sources are obtained from earth ,water , sun , plants etc. These sources are widely used for power generation. Solar and wind power generation is an attractive source because they are eco-friendly. Hybrid system is a mixture of different renewable energy source like solar energy, biomass power , wind etc. In the Hybrid power generation the generated power is firstly stored in the battery and then it is used to fulfill the demand of energy. Now days wind and solar energy system is growing with a great speed and conventional energy source is depleting day by day and it is going to vanish in coming years. So we have to search a new energy source which is pollution free, easily available. In sunny days the energy is provided by the sun while on cloudy day the power is supplied by the wind system. Solar energy is converted with the help of photovoltaic panels whereas the wind energy is converted with the help of wind mill. This hybrid system is made to fulfil the energy demand. By using hybrid system the transmission cost is reduced in the remote areas, as it can be established there to provide power.

SOLAR POWER

Conversion of sun energy into electricity with the help of photovoltaic panels is known as solar power.

It consists of a solar panel, when the sunlight strikes the panel the emission of electron takes place from the surface of the panel which results to electrical energy. This energy is stored in a battery for future use.

WIND ENERGY

Wind power is generated by using natural wind present in the environment. this wind flow is through the wind turbines to rotate the turbine so that mechanical energy is converted into electrical energy. This wind turbine is situated on a pole at a height of approx 60-65m.

Components of hybrid system-

(1) Solar panel

(2) Wind turbine

(3) Charge controller

(4) Battery storage

(5) Inverter

SOLAR PANEL

Solar panel is used to convert sun rays into electrical energy. No of solar panels forms a module which is connected in series or parallel to generate electricity. It is only medium to convert sun rays into electricity.

WIND TURBINE

Wind turbine collects wind so that blades rotates.

Two types of blades are there-

(I) Vertical

(2) Horizontal

Fluctuating power is generated by wind system. Firstly power is stored in a battery to make power non fluctuating and than used for load.

CHARGE CONTROLLER -

It is used to regulate the power generation of solar - wind system it is also used for over charge protection and short circuit protection and varies the power according to the demand load power is obtained from battery when it is not generated.

BATTERY STORAGE-

It is used to store the power size of battery is choose a/c to the load required.

INVERTER-

Inverter is used to convert the stored DC into AC power. As our electrical equipment operates on ac that's why we need to convert DC to AC supply.

ANALYSIS METHOD

A. Windowgrapher

Windowgrapher is a wind data analysis program. it reads raw data related to wind , produces variety of graphs and provide tools for quality control of data.

B. Homer

It means "hybrid optimization Model for energy Renewable". This software contains a number of energy component models and evaluates suitable technology based on cost and availability of resources. The simulation of HOMER is done for both on grid and off grid design.

SOLAR ANALYSIS

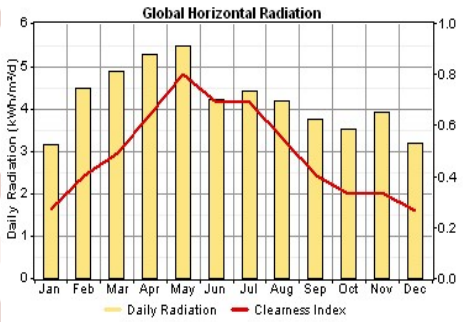
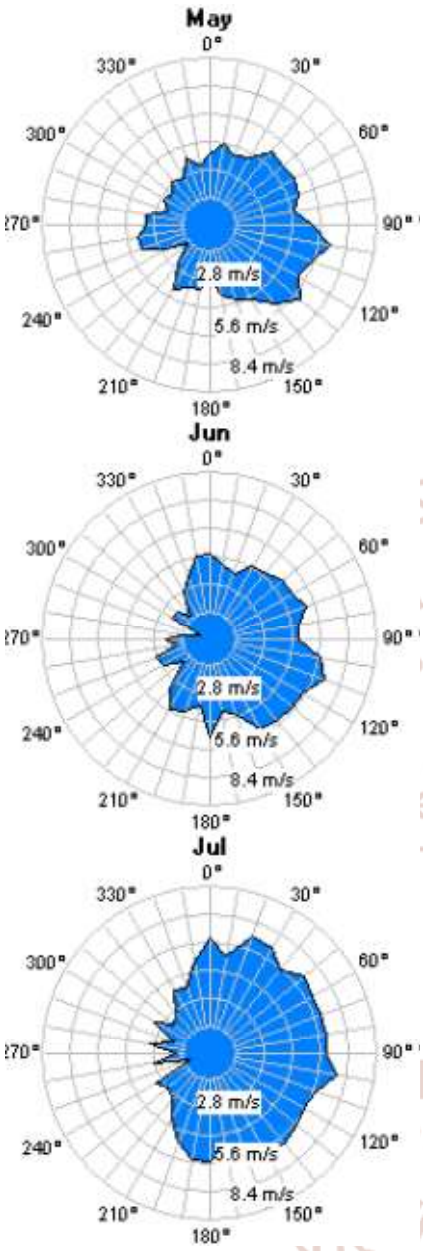


Fig - Avg solar radiation

The above graph shows the variation of the solar radiation in different months of the year. By using graph we can say that solar radiation is maximum in the month of may and minimum in the month of October of that particular area.

WIND SPEED ANALYSIS



The above fig shows the wind speed of the month of may, june and july. As we can see clearly the wind speed scattering varies within 3 months.

DISADVANTAGE OF ONE ENERGY SOURCE

A. Solar System Working Alone

- The solar radiation changes according to time. Thus solar rays is not constant through each time interval sometimes it is more and sometimes unavailable like in night.
- At night time the solar rays are completely absent. In rainy season the solar energy is not in sufficient amount.As a result this system is not able to supply power in this weather.

B. *Wind Energy Generation System Alone*

- The unpredictable nature of the Wind does not provide constant power generation.
- The mean of the wind speed is 3.6 -4.8 m/s which is not sufficient for standalone system.

Problems with Standalone System

- For wind energy a proper area is to be chosen to established the wind energy site. For this we have to choose the site where there is wind is available in large amount like coastal ares or islands.
- From wind rose assay we see that wind acceleration and direction alter seasonally. For optimum achievement power generation one needs to set the agent perpendicular to the best wind acceleration direction. In that case we shall charge to architecture adaptable wind agent assemblage which is not achievable and implementable for a poor country like ours.

HYBRID ENERGY SYSTEM

Hybrid energy is the combination of more than one energy source. Combination of solar and wind is better among all the other combination.

Advantages with Hybrid System

- In rainy and winter season the amount of solar radiation is not sufficient than in this season energy is fulfilled by wind energy system.
- Due to variation in weather condition when there is lack of wind energy than the power is supplied by the solar panels.
- Low operating cost and maintenance cost makes it economical.
- Used in any location whether it is remote area or populated area.
- Highly efficient power generation
- Solar- and wind-powered sites benefits the environment as it will reduce the carbon and other harmful emission is about 90% in environments.

APPLICATIONS

1) Distributed power generation
2) Hospital, Hotels, Guesthouse etc..
3) Remote and Rural area Electrification.
4) Street lighting.
5) Transmission and communication Tower and many more application

CONCLUSION

As we come to know that the hybrid system has a more per unit production cost but uses the available resources in a efficient way. This Hybrid system is also able to recover from any accidental or undesired situation. Also hybrid system is able to fulfill the energy of remote and rural areas. So it is clear that Hybrid system is the better choice..

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