

A CASE STUDY ON SOLAR & WIND HYBRID SYSTEM GENERATION OF POWER

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ABSTRACT

In our day to day life electricity is most important part of human life. Everyone in the world is depending on the electrical energy. Earlier in 20th century electricity was generated by conventional energy sources like coal, natural gas, mineral oil etc. But these sources are going to finish on a day and it also produce pollution which is the greatest problem for today. So it is essential that to use non-conventional resources for electricity generation which are most economical and free from waste. So now in 21st century we are using non-conventional energy sources for electricity generation such as wind, solar, biomass etc. For continuous generation in all weather conditions and these resources alone cannot produce electricity continuously. So to improve the efficiency, increase generating voltage hybrid systems are designed. In which more than two non-conventional resources are combined .The most commonly available resources on the entire world are solar and wind, these two sources are the roots of energy found on the earth. These resources have their own importance in our life. No one in the world live without these two resources. The purpose of this paper is to analyze the separately generated power by solar & wind with generating by combining the both. This shows how efficient a hybrid system on individual sources.

Keywords: Hybrid system, Generation, Resources, Solar, Wind, Power, Energy

Introduction:

Today electricity is the basic need of people around the world which shows how we are depend on it. For generation of electricity there are two ways as by conventional sources and non-conventional energy sources. Now maximum generation is takes place by conventional resources i.e. coal, diesel, and nuclear etc. It is important to understand that these resources produce waste, responsible for pollution. The nuclear is very harmful to human beings. The conventional resources are depleting day by day. Soon it will completely vanished from the earth so we have to find another way for electricity generation. A alternative for conventional energy resources are non-conventional resources which are free from waste, pollution and economical i.e. solar, wind, tidal, geothermal etc. Solar and wind are easily available in all conditions. The solar and wind are good alternative source. There is a drawback of solar energy and that is it cannot produce electricity in rainy and cloudy conditions. To overcome this we can use two energy resources so if one of the source fails other will keep generate electricity. And in good weather condition both generate electricity.

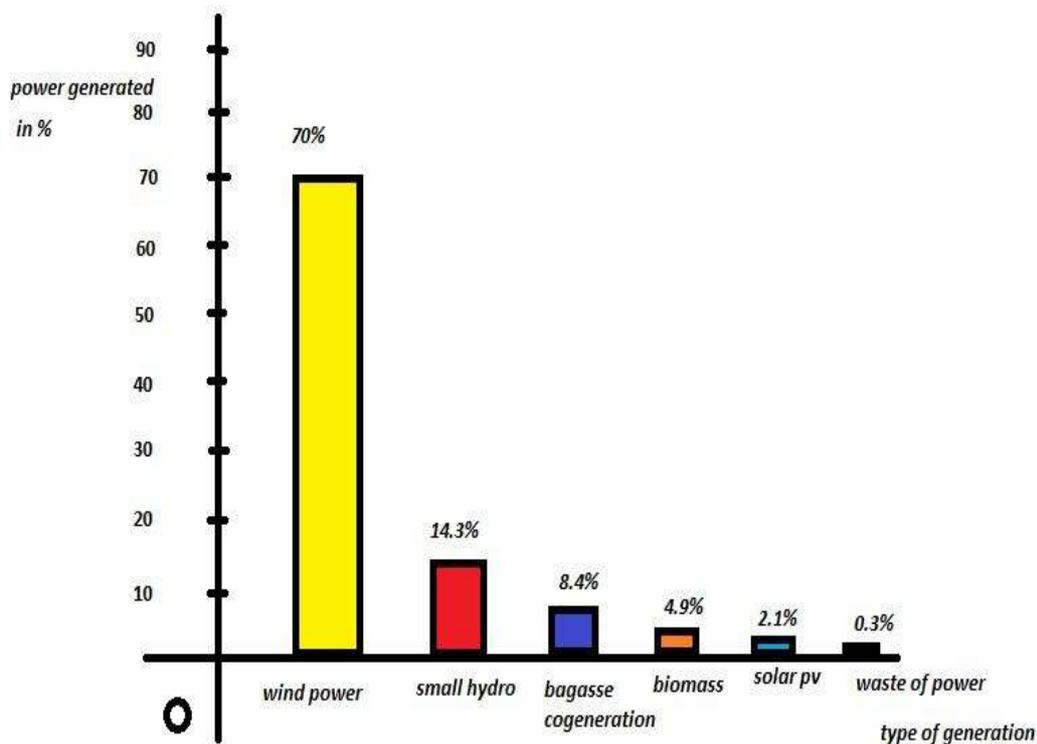
A. Solar Energy

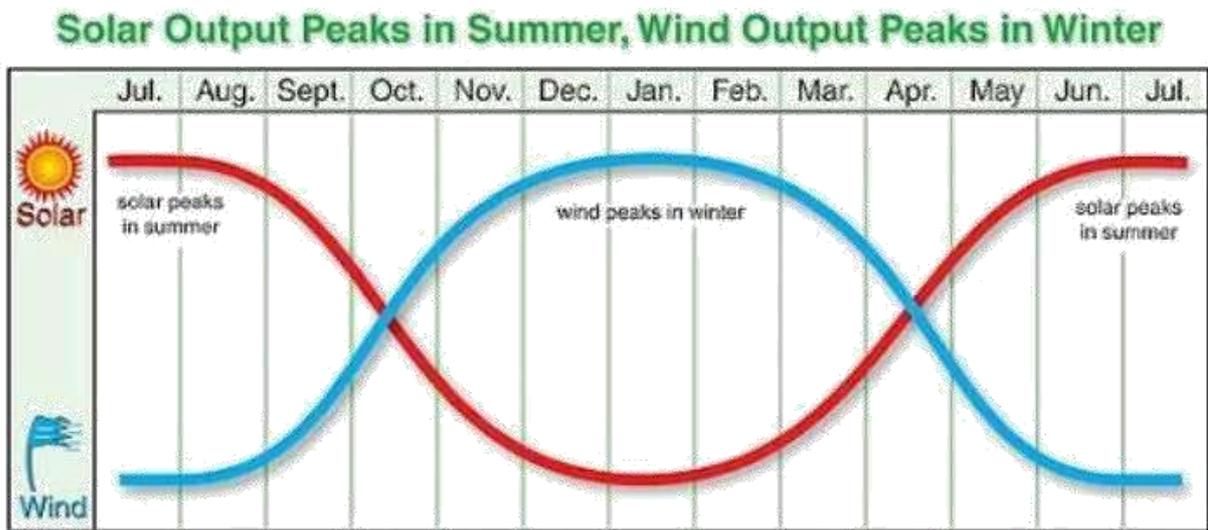
Solar energy is that energy which is gets by the radiation of the sun. Solar energy is present on the earth continuously and in abundant manner. Solar energy is freely available. It doesn't produce any gases that mean it is pollution free. It is affordable in cost. It has low maintenance cost. Only problem with solar system it cannot produce energy in bad weather condition. But it has greater efficiency than other energy sources. It only need initial investment. It has long life span and has lower emission.

B. Wind Energy

Wind energy is the energy which is extracted from wind. For extraction we use wind mill. It is renewable energy sources. The wind energy needs less cost for generation of electricity. Maintenance cost is also less for wind energy system. Wind energy is present almost 24 hours of the day. It has less emission. Initial cost is also less of the system. Generation of electricity from wind is depend upon the speed of wind flowing.

Major disadvantage to use non-conventional energy source independently is unavailability of power for all time. In this proposed we can use both the sources combined. Another way is that we can use any one source and keep another source as a stand by unit. The graph below shows the independent sources have different generating percentage in India throughout the year.





Graph:-1 yearly generation of power by solar and wind independently

C. Hybrid energy system:

A hybrid energy system is the combination of two or more energy sources for generation of electricity. It has good reliability, efficiency, less emission and power loss.

In this proposed system solar and wind power is used to generating power. Solar and wind has more advantages than that of other non-conventional sources. Both the energy sources have greater availability in all areas and weather. It need lower cost. There is no need to find a specific location to install the system. Following block diagram shows how power is generated by solar and wind hybrid system.

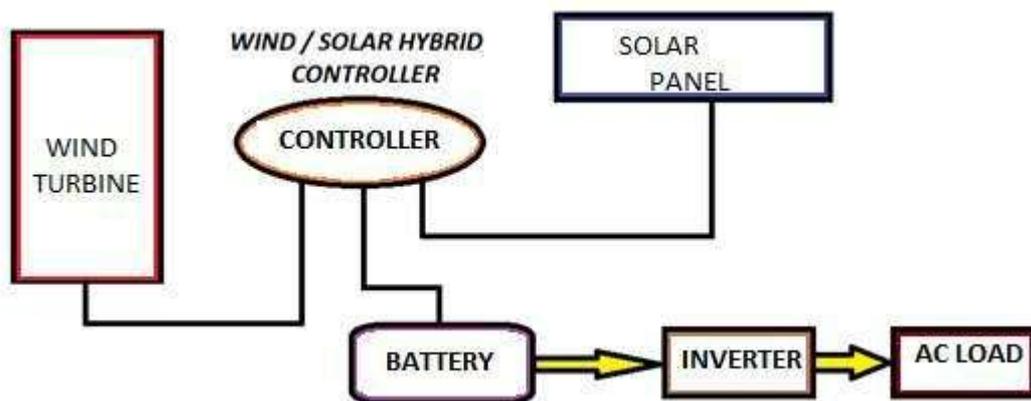


Table:-1 Flow chart solar-wind hybrid system

Above diagram shows various blocks of solar and wind hybrid system .

1. Wind turbine
2. Solar panel
3. Wind / solar hybrid controller

4. Battery
5. Inverter

1. Wind turbine :

Wind turbine is a system that extracts energy from wind by rotation of the blades of wind turbine. These are of two types wind turbines as horizontal and vertical. Whenever the direction of wind changes according to it face of wind turbine is changes. The output power from wind is not continuous for non-fluctuating power we have to store in battery and then supplied to the load.

2. Solar panel :

Solar panel is the medium that convert solar radiations to electrical energy. A PV cell is similar to classical diode with PN junction formed by semiconductor material. When the junction absorbed light, the energy of absorbed photon is transferred to electron-proton system of material, creating charge carriers that are separated at the junction. The charge carriers in junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. For generating required voltage and current numbers of solar panels are connected in series – parallel combination.

3. Wind/Solar hybrid controller:

Its basic function is that to control the source which is to be active or dative. Simultaneously it charge battery and supply provides to the load. It protect whole assembly from short circuit, over charging, pole confusion protection and automatic dump load function. According to the load demand we can vary power. If we want high power then it supplies combined power supply to the load.

4. Battery :

As per load requirement battery size is selected so that it fulfill the requirement of load. For calculating size of battery bank we needed to find following data.

- 1) Total use in watt-hour (Wh)
- 2) Total backup time of battery

5. Inverter :

Inverter is a device which converts DC power into AC power. Power stored in battery is DC then for AC loads inverter converts DC power to AC power and supplies.

Solar-wind hybrid energy system have more installation cost than that of running cost. Once it installed then it work for a long time. The cost of system is depend upon the system chosen, wind resource on the site, electric cost in the area and the battery bank required. If we increase the use of non-conventional sources it will helps to reduce the cost of the system. It also helps to reduce the transmission cost in various regions where it is difficult to transmit electricity by overhead transmission lines then we can directly install this hybrid system. Some of the advantages are given:

- It does not eliminate bi products which affects atmosphere.
- Only one time investment is needed to installing and maintenance is not required in small duration of time. And because of this public supports this type of systems.
- Because the use of atmospheric wind and solar energy there is no need of external source for generation.
- These advantages gives it a global support and applicable for domestic purpose.

- According to our need we can increase generation capacity of the system.

CONCLUSION

We conclude that, the Solar-Wind Hybrid System is best generation system. Where the administration is unable to reach and transmission is difficult. To reduce the transmission cost we can directly install the hybrid system. The graph shown in this research paper will helpful for implementation of hybrid system in future . To increase the production we can take more numbers equipments and also we can obtained good output power by applying shunt capacitor bank to improve the power factor. The graph is helpful to understand annual generation of generated power throughout the year in India by various power generating systems.

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