

A review of Hybrid Power Generation using Non-conventional resources

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ABSTRACT

Electricity plays an important role in human's life .Anywhere , in the world at all the times Electricity is available with low cost and pollution free . This paper present the generation of electricity and availability of natural resources without disturbing the ecological balance. Now a day all the non-renewable energy sources are decreases, so have to place non-renewable to renewable energy sources. Hybrid generation is the combination of two energy resources i.e solar and wind energy. By using hybrid generation we have to produce uninterrupted supply. This solar-wind hybrid power generation system is use for domestic as well as industrial purposes. The equipment use in hybrid generation are PV solar cell, wind mill, an inverter (use to convert dc power to ac power), electrical load, fuse & junction boxes, associated wiring, and test instruments for measuring voltages.

Keyword: *Solar energy, Wind energy, Renewable energy, Hybrid power system.*

I.INTRODUCTION

Natural resources like coal, oil, Radio-active material etc. we get destroy in future. The available power generating system like hydro- electricity power generating plant cannot afford much power as it is season based although it causes less pollution. The aim of this work is to design and implement a hybrid power generation system using wind energy and solar energy. The favourable global political climate toward these energies efforts to reduce carbon dioxide (CO₂) and greenhouse gases (GHG) and other power plant pollution, global awareness of climate changes and the urgency to develop renewable energy source for this reason the solar and wind power are most used. In other state the solar and wind energy using for public purpose we paid for the state as per the country, state like US, UAE as per the "Renewable portfolio standard(RPS)". As per the law some percentage of the energy from sustainable energy sources within reasonable stipulated times. In case of standalone solar photovoltaic system cannot provide reliable power during non-sunny days. Also in case of the standalone wind energy system cannot supply constant load demand due to significant fluctuation in the magnitude of wind speeds from hour to hour throughout the year. Therefore need of storage system in required for each system to fulfil the load demand. That's why the storage system is large cost and the size is reduced to a minimum possible for renewable energy system to a cost effective. The advantage of the solar and wind hybrid system is when the power production is used together, the reliability of the system is enhanced.

II.METHODOLOGY

2.1Solar Wind Hybrid Energy System

Solar wind hybrid power system is the combination of power generating system from wind mill and PV module. By using this system power generated from solar panel when light radiation is available and windmill when wind sources available. Solar and wind both the energy sources have greater availability in all areas. It consist of solar panel, wind turbine, charge controller, battery bank, inverter, electrical load.

2.1 Solar Panel:

Solar energy is the energy that is available from the sun .Solar panel is used to convert solar energy into electrical energy. Solar cells is the use of electronic characteristic of semiconductor materials to achieve solid PV conversion device. The photovoltaic cells are nothing but solar cell. When sun rays are incident on solar panel it can convert into electricity and that effect is called as photovoltaic effect. Solar cell array consist of allow able number of solar cells connected in series or parallel based on requirement of current and voltage. It is a device whose electrical characteristics, such as current voltage, or resistance, vary when exposed to light.

The operation of photovoltaic requires three basic attribute; The absorption of light and generating electron-hole pair, The separation of charge carriers of opposite types, The separate extraction of those carriers to and external circuit. The various material in the solar array are used Crystalline silicon, Thin-film, Multi-junction cells.

PV panels are made by connecting a certain number of solar cells in series . the connecting in series to from a terminal voltage, current flowing is decided by the weakest solar cell. Parallel connection of the cells would solve the low current issue but the ensuing voltage is very low. These panel are further connected in series to enhance the power handling ability.

2.2 Wind Turbine

Wind turbine is used to convert the wind energy into electrical energy which is renewable energy source. Electric generator which is placed inside the turbine is converts the mechanical energy into electrical energy.In the wind power system generation of the power increases. This wind power system is highly affected in rainy season and produces less wind speed. This system is pollution free and environmentally balanced. The general operation of wind turbine is to capture power from the wind by means of aerodynamically designed blades and convert it to mechanical power. The number of blades is three in modern wind turbine. The wind flow, or motion energy, when “harvested” by modern wind turbines can be used to generate electricity. The most weight efficient way to convert the low-speed, high-torque power to electrical power is to used a gear-box and a standard generator including a power electronic interface.

There are basically two types of wind turbine; vertical axis wind turbine and horizontal axis wind turbine. simply stated, wind turbine is the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines us wind to make electricity. The wind turns the blades, which spin a shaft, which connects to generator

and makes electricity. Various parts of wind turbine are; Rotor, Blades Gear box, Generator. Blades are flattened plates which catch the wind. The blades are Light weight, durable and corrosion-resistance. Rotor is the rotating part of the wind turbine on which the blades are held and which is directly connected to the generator to give mechanical input. Gear box is mechanical part which amplifies the energy output of the rotor. It is placed directly between the rotor and generator. Generator is a electrical device which take mechanical energy as input a converts it to give electrical energy as output.

III. HYBRID SYSTEM

This block diagram of the hybrid power generation system using solar and wind power. This block diagram includes following blocks,

1. Solar panel
2. Wind turbine
3. Charge controller
4. Battery
5. Inverter

1. Solar panel:

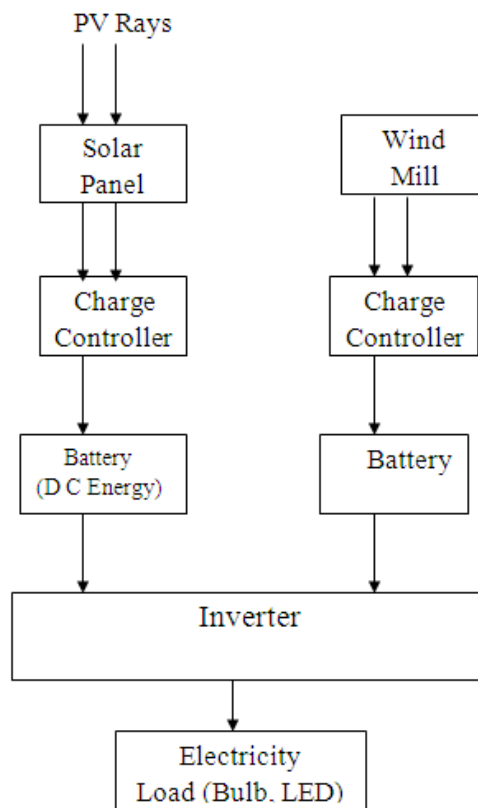
Solar panels are the medium to convert solar energy into the electrical energy. Solar panel can convert the energy directly or heat the water with the induced energy. PV cells are made up from semiconductor structure as in the computer technology. Sun rays are absorbed with this material and electrons are emitted from the atom. This release activates a current. Photovoltaic is know as the process between radiation absorbed and the electricity induced. Solar power is converted into the electrical power by a common principle called photovoltaic effect.

2. wind turbine :

The wind turbine is use to convert the wind power into electrical power. The energy production by wind turbines depends on the wind velocity acting on the turbine. Wind power is able to feed both energy production and demand in rural areas.

3. Charge controller:

Charge controller has basic function is that it control the source which is to be active or inactive. It simultaneously charge battery and also gives power to the load. The controller has over-charge protection, short circuit protection , pole confusion protection and automatic dump load fuction. It also the function is that it should vary the power as per load demand. It add the both the power so that the load demand can fulfill. And when power is not generating it should extract power from battery and give it to the load.



IV.BATTERY

The batteries in the system provide to store the electricity that is generated from the wind or solar power. Any required capacity can be obtained by series or parallel connections of the batteries. The battery that provides the most advantages operation in the solar and power system are maintenance free dry type utilizes the special electrolytes. We have to choose battery bank size per the load requirement so that it should fulfill the requirement of load for calculating the battery bank size we need to find following data

1. Find total daily use in watt-hour.
2. Find total back up time of battery.

For increase in battery bank size we need to connect cell in series so that we can get the larger battery bank size.

V.INVERTER

Inverter is need to convert dc power to ac power . Energy stored in the battery is drawn by electrical loads through the inverter. As our load working on the Ac supply so we need to convert Dc power. The input voltage output voltage and frequency and overall power handling depends on the design of the specific device or the circuitry. The inverter dose not produce any power. The power is provided by the Dc source.

5.1 .Proposed calculation:

The total power generated by this system is giving by;

$$P(\text{total}) = N(\text{wind}) * P(\text{wind}) + N(\text{solar}) * P(\text{solar})$$

Where,

P(Total) is the total power generated.

P(wind) is the power generated by the wind turbine.

P(solar) is the power generated by the solar panel

N(wind) is the no of wind turbines

N(solar) is the no of solar panel used.

A. calculation for solar energy:

power is calculated as;

$$P(\text{solar}) = I_{\text{ns}}(t) * A(s) * \text{Eff}(Pv)$$

Where;

$I_{\text{ns}}(t)$ is isolation at time t (kw/m²)

A(s) is area of a single solar cell (m²)

Eff(Pv) is overall efficiency of the pv panel and Dc/dc converter.

Overall efficiency is given by;

$$\text{Eff}(pv) = H * PR$$

Where;

H=annual average solar radiation on panel.

PR= performance ration, coefficient for losses.

B. Calculation for wind energy:

The power generated by wind energy is;

$$P(\text{wind}) = \frac{1}{2} \rho (A_w) * (V)^3$$

Where;

P is power in watt(w)

ρ is the air density in kilogram/cubic meter(kg/m³)

A_w is the swept area by air in square meters(m²)

V is the wind speed in meters per second(m/s).

VI.CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resource. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can utilize where it generated so that it will reduce the transmission losses and cost. We encourage the scientific community to consider this technology along with others when contemplating efforts and resources for solar and wind. Overall it is good, reliable and affordable solution for electrical generation.

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