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Hybrid Power System Using Wind Energy and Solar Energy

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ABSTRACT: Now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this the combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose.Generation of electricity will be takes place at affordable cost. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

KEYWORDS: Electricity, Hybrid, Solar, Power, Wind.

I.INTRODUCTION

Solar energy and wind energy have been deemed clean, inexhaustible, unlimited, and environmentalfriendly. Such characteristics have attracted the energysector to use renewable energy sources on a larger scale.However, all renewable energy sources have drawbacks.Wind and solar sources is dependent on unpredictablefactors such as weather and climatic conditions. Due toboth sources, complementary nature, some of theseproblems can be overcome the weaknesses of one withthe strengths of the other. This brings us to the hybridsolar-wind power plant concept. Hybrid energy stationshave proven to be advantageous for decreasing thedepletion rate of fossil fuels, as well as supplying energy to remote rural areas, without harming the environment.

The main objective of this paper is to assess the feasibility and economic viability of utilizing hybrid Solar–Wind–battery based standalone power supply systems to meet the load requirements.

II. SOLAR ENERGY

Solar energy is energy from the Sun. It is renewable, inexhaustible and environmental pollution free. Nigeria, like most other countries is blessed with large amount of sunshine all the year with an average sun power of $490\text{W}/\text{m}^2/\text{day}$. Solar charged battery systems provide power supply for complete 24hours a day irrespective of bad weather. Moreso, power failures or power fluctuations due to service part of repair as the case may be is nonexistent.

III.WIND ENERGY

Wind is a natural phenomenon related to the movement of air masses caused primarily by the differential solar heating of the earth's surface. Seasonal variations in the energy received from the sun affect the strength and direction of the wind. The wind turbine captures the winds kinetic energy ina rotor consisting of two or more blades mechanically coupled to an electrical generator. The turbine is mounted on a tall tower to enhance the energy capture

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IV. HYBRID ENERGY SYSTEM

The Word hybrid means something which is made by the combination of more than one element. In energy system the electricity can be generated by more than one source at a time like Wind, solar, biomass etc. There are various module to generate hybrid energy like wind-solar hybrid, Solar-diesel, Wind- hydro and Wind–diesel. Among the above hybrid energy generation module the wind-Solar hybrid module are more important because it is abundant in nature and it is very much environment friendly.

Hybrid energy generation is more important because the wind not floe continuously and sun radiation is only present approx. 8 to 10 hours in a day. So for continuous power it is important to hybridize the solar and wind power with the storage batteries. The hybridization in India has large prospect because over 75 % of Indian household face the problem like power cut specially in summer

V.BLOCK DIAGRAM OF HYBRID WIND SOLAR ENERGYSYSTEM

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

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

1. Solar panel

Solar panel is use to convert solar radiation to the electrical energy. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electronproton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. Solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage. Solar panels are the medium to convert solar power into the electrical power.

2. Wind turbine

Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating. For obtain the non-fluctuating power we have to store in battery and then provide it to the load.

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 dumpload function. It also the function is that it should vary the power as per the 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

4. Battery Bank

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 (Wh).
- 2.Find total back up time of the battery

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

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5. Inverter

We have to choose greater rating inverter than the desired rating. The pure sine wave inverter is recommended in order to prolong the lifespan of the inverter. Inverter is used to convert DC power into AC power. As our load works 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 does not produce any power. The power is provided by the DC source.

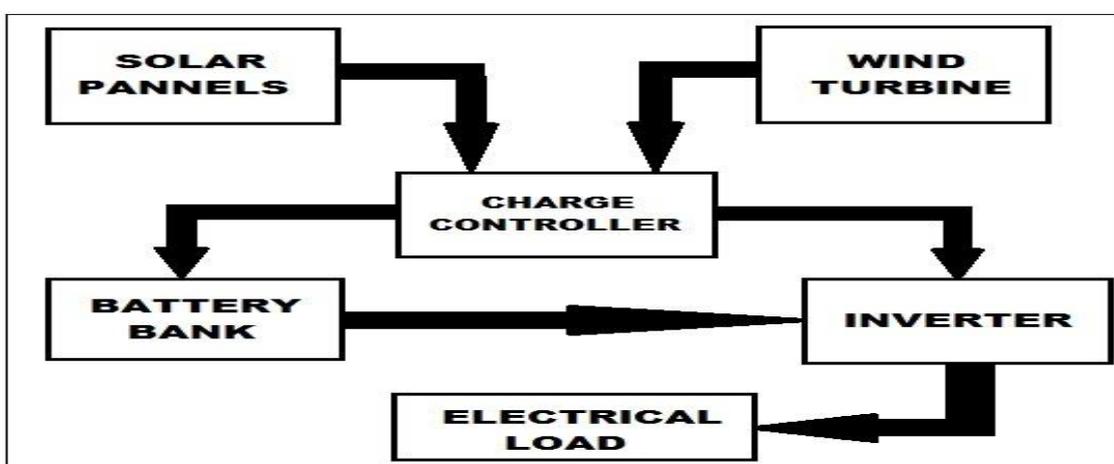


Fig.1 Block diagram of Hybrid energy system

VI. SIMULATION RESULTS

Simulating the whole HPS is an efficient and safe way to test different control systems. The HPS model was developed in pieces with Simulink. First a solar model was created then tested. Next, a wind turbine model was developed from the solar model and tested through a variety of cases. The HPS model, shown below in Figure-2, consists of a central bus capacitor with inputs for wind, solar, and buck current. In addition, there is a bus voltage output. This capacitor must have balanced currents on the input if the voltage is to remain stable.

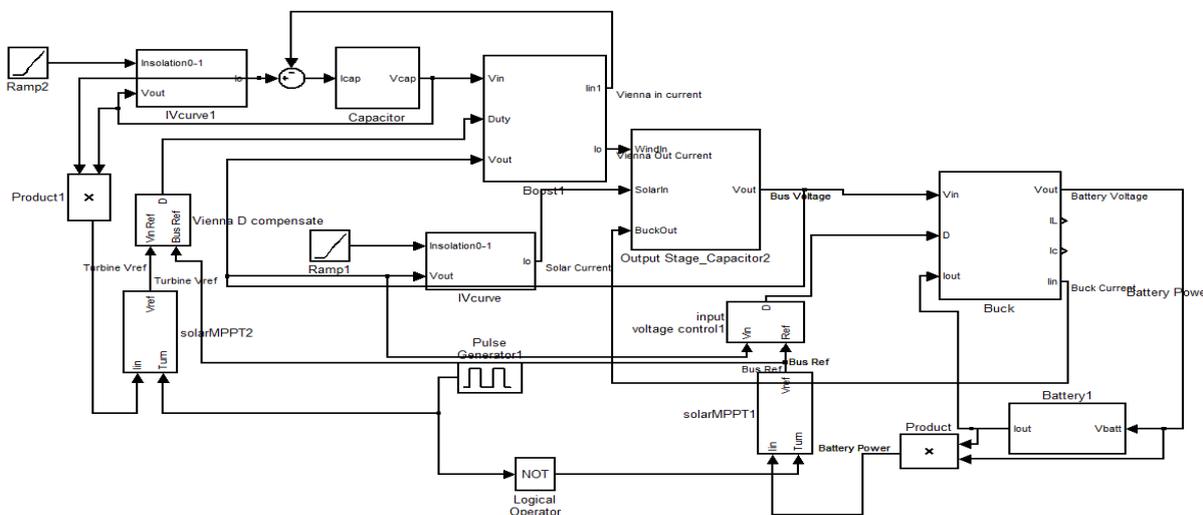


Fig.2 HybridPowerSystemSimulinkModel

The results of this simulation, shown in Figure-3, display faster convergence times for the solar power. Wind

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power appears to take longer randomly. It appears that the algorithm stumbled upon the correct value. The rest of the startups have much longer convergence times.

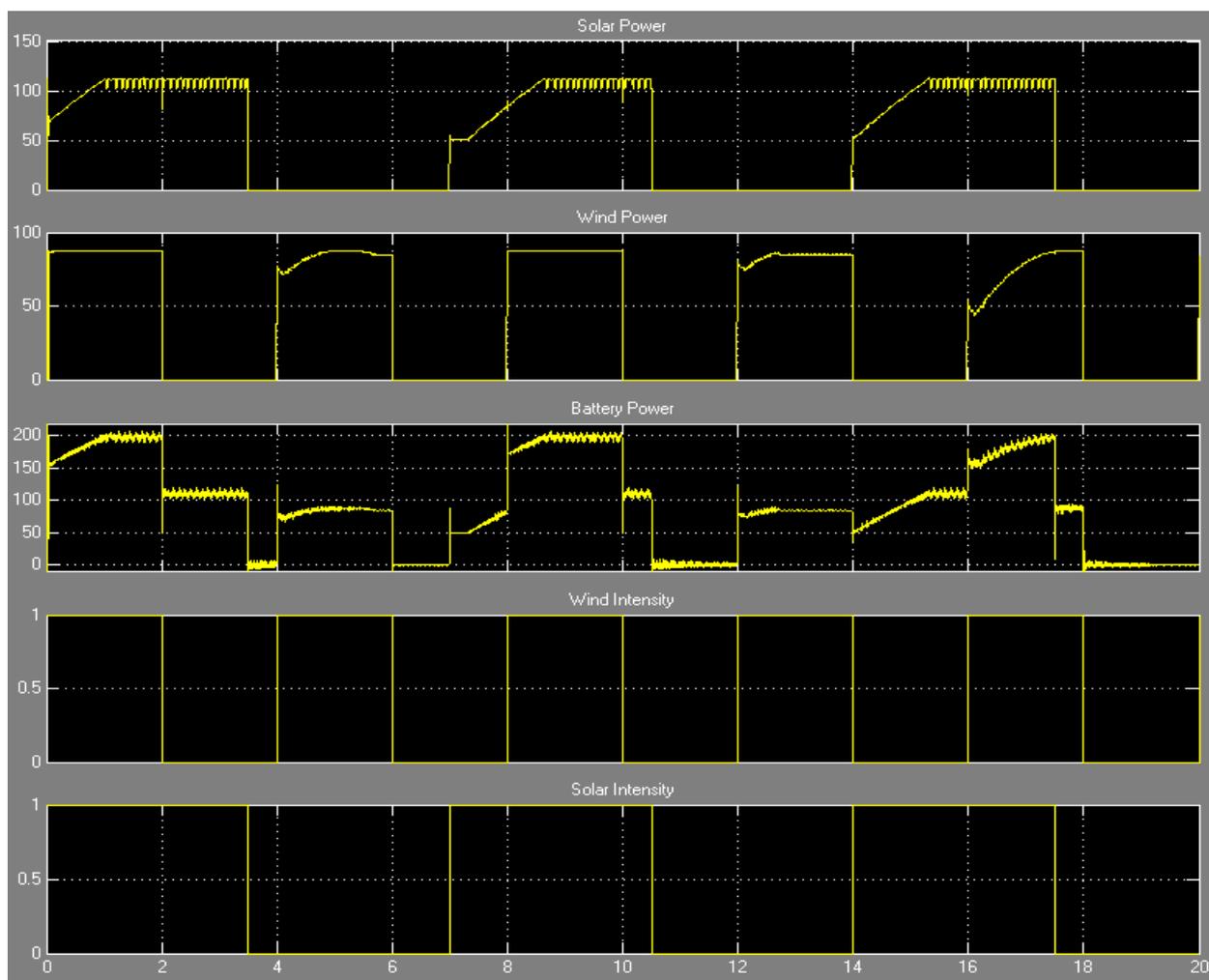


Fig.3 Both sources vary, Simultaneous MPPT method

VII. CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilized where it is generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should be motivated to use the non-conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is a cost-effective solution for generation. It only needs initial investment. It has a long life span. Overall it is a good, reliable, and affordable solution for electricity generation.

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