A NOVEL EXPLORATION OF HYBRID PV SYSTEM: A REVIEW

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***Abstract*: The Renewable energy development continues to improve due to conditions important to industrial fuels such as oil and natural gas. Therefore, the importance of renewable energy has increased in recent years. There are other benefits, such as multiple availability of environmentally friendly recycling. There are several renewable energy sources such as the sun, wind, water, and earthquake. Through these proficient assets, solar and wind energy are the quickest developing energy sources on the planet. In the presence of pollution costs, energy is a change in energy and photovoltaic cells. Electricity demand is increasing every day. However, the available base load devices can not to supply power as needed. Therefore, these energy sources can be used to supply needs to peak loads. Through this paper the investigation find the way that how to integrate the PV cell and wind in one panel.**

***Keywords*: Renewable energy, PV Cell, wind Generator, Hybrid System**

1: Introduction: This little autonomous power age framework can be utilized in remote zones where traditional power age is not practical. In this paper, we study and use a hybrid power generation system for air equipment. Cross breed frameworks are increasingly important in light of the fact that the individual power age frameworks are not totally solid. When the system is shut down, another system can provide power. The block diagram is shown to the entire hybrid system.

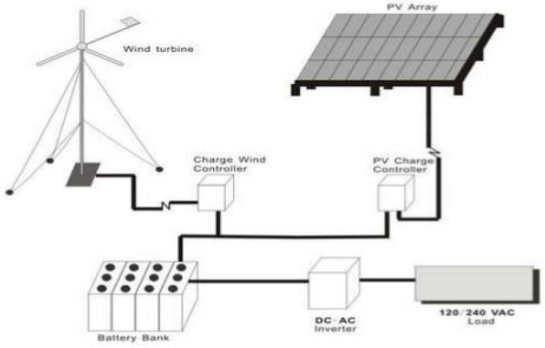

Fig. 1: Block diagram of hybrid system

The whole cross breed framework comprises of a PV system and a wind power system. The nearby planetary group is driven by sun based vitality, and it is extremely basic nature. Sun powered power modules, most extreme power point following Framework, comprises a close planetary system. The light occurrence on the PV cell is changed over to electrical vitality by the sun oriented authority. A Maximum power point following framework utilizing unsettling influence and ingestion calculations can get most extreme power from the PV module. An AC-DC converter is utilized to change over AC voltage to DC. [1] Wind energy systems include wind turbines, gear boxes, generators, and AC - DC converters. Wind turbines are utilized to change over wind vitality into pivoting mechanical vitality and use generators to change over the mechanical vitality accessible on the turbine shaft into electrical vitality. So as to constrain the most extreme power point following framework, we utilize the greatest yield of the power point tracking system. Both vitality frameworks are utilized to charge the battery utilizing a bi-directional converters. Bidirectional converters and batteries structure an extra burden basic to wind vitality and solar based system. Utilizing a hybrid supply system with various single power supplies will incredibly improve the unwavering quality of load requirements. Hybrid systems can achieve higher power generation. Standalone systems can provide load-free output regardless of weather conditions. An efficient energy storage mechanism is needed to convert the energy output of the solar power generation system into stored energy and to supply constant power via through the wind turbine, which can be achieved by the battery pack. [2] Research and simulate the wind power generation system and implement a hybrid system that tracks its maximum power point.

In 1839, French physicist Edmond Becquerel proposed that couple of substances can create power when presented to daylight. Be that as it may, Albert Einstein clarified the photoelectric impact and the idea of light in 1905. The photoelectric effect claims that electrons stream when photons or sunlight hits the metal surface. The subsequent photoelectric effect is the basic principle of photovoltaic technology. The first PV module was produced by Bell Laboratory in 1954. [3]

2. PV Cell

Solar cells are electronic devices that convert sunlight directly into electrical energy. Light that shines on solar cells generates electricity and voltage to generate electricity. In this procedure, first, the retention of light raises the electrons to a higher vitality state, and besides, a material is required to exchange higher vitality electrons from the sun based cell to the outside circuit. The electron devours vitality in the outside circuit and comes back to the sunlight based cell. For all intents and purposes all photovoltaic vitality change utilizes semiconducting materials as PN junctions, although different materials and procedures may conceivably fulfill photovoltaic energy conversion requirements.

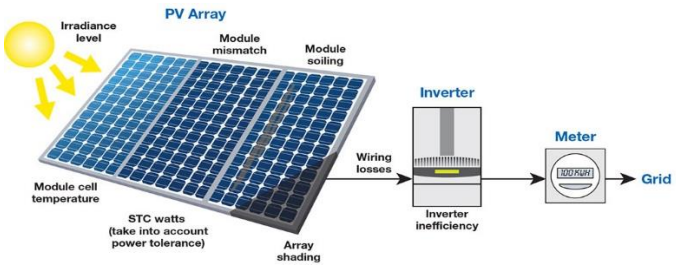

Fig. 2 Actual understanding of PV system

The basic steps of solar cell operation are as follows.

- Generation of photo generated carriers.
- Generate current by collecting carriers that generate light.
- A large voltage is generated in the solar cell. And
- Power dissipation in load and parasitic resistance.

Solar power generation straightforwardly changes over light to power at nuclear dimension. A few materials show properties known as photoelectric impacts that assimilate photons of light and transmit electrons. When these free electrons are caught, it is the aftereffect of the flow that can be utilized as power.

3. Wind Power System

Around 5000 years prior, the breeze was first used to get to the explore Nile. Europeans use it to separate water and grains pounds somewhere in the range of 1700 and 1800.The first windmill for power generation was installed in the United States in 1890. In 1979, a grid-connected wind turbine with a 2 megawatt wind turbine at Boone near Mount Hornnoa. In 1988 3 MW turbine was utilized at Berger Hill in Orkney, Scotland. Wind control is utilized to light up remote structures that are not associated with the grid. Today, wind turbines are reasonable for independent frameworks and vast utility generators (connectable to grids). In 2003, the world wind power generation capacity was about 39,294 MW, and India's breeze control age limit was 1,550 MW.

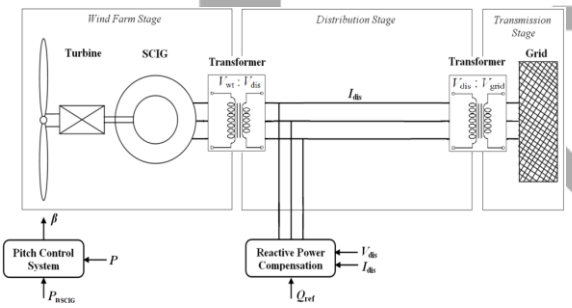

Fig. 3 Wind Turbine at different stage

3.1 Schematic diagram of the wind energy system

The system incorporates a wind turbine that changes over dynamic vitality of the breeze into rotational movement, a gearbox that matches generator speed and turbine speed, a generator that changes over mechanical vitality to electrical vitality, and AC voltage to DC rectifier and The rectifier and the DC converter track the maximum power point and battery charge and discharge through the bi-directional converter. [5]

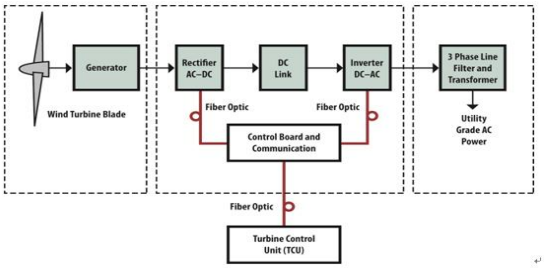

Fig. 4: Overall Block diagram of wind energy system

4. Research Background

Nema et al. (2009) the wind and solar energy are omnipresent, freely available, and environmental friendly. The wind energy systems may not be technically viable at all sites because of low wind speeds and being more unpredictable than solar energy. The combined utilization of these renewable energy sources are therefore becoming increasingly attractive and are being widely used as alternative of oil-produced energy. Economic aspects of these renewable energy technologies are sufficiently promising to include them for rising power generation capability in developing countries. A renewable hybrid energy system consists of two or more energy sources, a power conditioning equipment, a controller and an optional energy storage system. **Yang et al. (2008)** System power reliability under varying weather conditions and the corresponding system cost are the two main concerns for designing hybrid solar–wind power generation systems.

This paper recommends an optimal sizing method to optimize the configurations of a hybrid solar–wind system employing battery banks. Based on a genetic algorithm (GA), which has the ability to attain the global optimum with relative computational simplicity, one optimal sizing method was developed to calculate the optimum system configuration that can achieve the customers required loss of power supply probability (LPSP) with a minimum annualized cost of system (ACS). **Nema et al. (2010).** This paper gives the design idea of optimized PV-Solar and Wind Hybrid Energy System for GSM/CDMA type mobile base station over conventional diesel generator for a particular site in central India (Bhopal). For this hybrid system ,the meteorological data of Solar Insolation, hourly wind speed, are taken for Bhopal-Central India (Longitude 77o.23'and Latitude 23o.21') and the pattern of load consumption of mobile base station are studied and suitably modeled for optimization of the hybrid energy system using HOMER software. It is expected that the newly developed and installed system will provide very good opportunities for telecom sector in near future. **Badwawi et al. (2015)** Due to the fact that solar and wind power is intermittent and unpredictable in nature, higher penetration of their types in existing power system could cause and create high technical challenges especially to weak grids or stand-alone systems without proper and enough storage capacity. **Schmidt et al. (2016)** Brazil has to quickly expand its power generation capacities due to significant growth of demand. Government plans aim at adding hydropower capacities in Northern Brazil, additional to wind and thermal power generation capacities. **Saidi et al. (2017)** the sun and wind based generation are well thoroughly considered to be alternate source of green power generation which can mitigate the power demand issues. This paper

introduces a standalone hybrid power generation system consisting of solar and permanent magnet synchronous generator (PMSG) wind power sources and AC load. A supervisory control unit, designed to execute maximum power point tracking (MPPT), is introduced to maximize the simultaneous energy harvesting from overall power generation under different climatic conditions. Two contingencies are considered and categorized according to the power generation from each energy source, and the load requirement. A Simulink model of the proposed Hybrid system with the MPPT controlled Boost converters and Voltage regulated Inverter for stand-alone application is developed in MATLAB. **Nuño et al. (2018)** the deployment of Renewable Energy Sources (RES) is driving modern power systems towards a fundamental green transition. In this regard, there is a need to develop models to accurately capture the variability of wind and solar photovoltaic (PV) power, at different geographical and temporal scales. This paper presents a general methodology based on meteorological reanalysis techniques allowing to simulate aggregated RES time series over large geographical areas. **Shezan et al. (2016)** A large number of populations of the world; especially in developing countries; are living in rural or remote areas those are geographically isolated from the grid connection. Power supply and uninterrupted fuel transportation to produce electrical power for these areas poses a great challenge. Using renewable energy in off grid hybrid energy system might be a pathway to solve this problem.

5. Maximum Power Point Tracking

The Maximum Power Point Tracking (MPPT) framework is an electronic control framework that can drive the most extreme intensity of a solar power generation system. It does not contain a single mechanical element, and the movement of the module changes its direction and directs it to the sun. The MPPT control framework is a finished electronic framework that can change the most extreme permissible power through the working purpose of the electrical module. [12]

6. Objectives

The main purpose of this paper is to implement a hybrid power supply system of solar power generation and wind power. The goal of this step are follow:

- Research and modeling of PV cells, PV arrays and PV panels.
- Investigate characteristic curves and their effects due to environmental conditions such as temperature and radiation.
- Check PV module operation in partial shading state.
- Track the maximum operating power point of PV panels, regardless of environmental condition changes.

7. Methodology and Formulation

The complete power created by the framework might be given as the entirety of the power produced by the sun oriented PV board and the power produced by the wind turbine.

Numerically it can be represented as,

$P_T = N_W * P_W + N_S * P_S$ Where,

P_T is the total power generated

P_W is the power generated by wind turbines

P_S is the power generated by solar panels

N_W is the no of wind turbine

N_s is the no of solar panels used

A. Calculations for wind energy

The power produced by wind vitality is given by,

Power = (density of air * swept area * speed cubed)/2

$P_W = ½. \rho (A_W) (V)^3$

Where,

P is control in watts (W)

ρ, is the air thickness in kilograms per cubic meter (kg/m^3)
AW is the cleared region via air in square meters (m^2)

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

B. Calculations for solar energy

To determine the size of a PV modules, it is important to appraise the vitality utilization required. In this manner, the power is determined are as per the following:

$P_S = Ins\ (t) * A_S * Eff\ (pv)$ Where,

Ins (t) = isolation at time t (kw/m^2)

A_S = area of single PV panel (m^2)

Effpv = Combined productivity of PV board and dc/dc converters.

Overall efficiency is given by,

Eff(pv)= H * PR Where,

H = annual average solar radiation of the inclined panel.

PR = Performance ratio, coefficient for losses.

8. Conclusion

In the power VS voltage qualities of the PV module appeared beneath that there is a solitary greatest esteem, that is, the most extreme power point related with a given explicit voltage and current. The general proficiency of the module is exceptionally low, about 12%.Therefore, regardless of how the environmental conditions change, you need to work at the peak power point to be able to deliver maximum power can be supplied to the load. This increased power is suitable for use in photovoltaic modules. A DC/DC converter set beside the PV module infers greatest power by exchanging the circuit's impedance to the PV module in coordinating the impedance to PV module. Impedance coordinating can be achieved by changing the duty cycle of the exchanging component. So integration of PV and Wind might enhance the regulated current supply.

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