

Solar and Wind Powered UPS System

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Abstract— As the demand for electricity is rising every single day, this demand would be hard to meet with the regular production of electricity by using non renewable resources of energy. Hence making use of some renewable resources of energy like solar energy and wind energy can be of great help to meet the demand of uninterrupted power supply. The survey conducted focuses on the design of a UPS system which stores the power generated from solar and wind energy and this power can be used for various applications, in this case to drive the water pump installed in fields for irrigation purpose which can be of great help to the farmers.

Index Terms: Renewable resources of energy, Solar energy, UPS system, Wind energy.

I. INTRODUCTION

The electricity provided by the conventional grids is unreliable especially in rural areas where the current supply is not regular and it is needed the most to drive the water pumps for irrigation purpose.

To minimize this issue of unreliable supply of electricity, the proposed design utilizes a UPS system which is charged by the renewable resources of energy like solar and wind energy. But these resources can be unpredictable in nature. So, using only solar energy may not be efficient on cloudy days as it would have been on a sunny day and in the same way using only wind energy may not be much efficient on non windy days.

Perhaps, the integration of these two renewable resources into an optimum combination would be an efficient method to continuously charge the batteries of the ups.

The cost of installation of the solar panels can be expensive hence in this project we also try to design a methodology that can improve the solar panel efficiency by making use of lesser number of solar

panels to get the desired output voltage, which in turn reduces the number of solar panels needed for installation and thereby reducing the installation cost.

II. LITERATURE SURVEY

Nishant Jha et al [1] have proposed a dual energy generation system for integrated grids to prevent the wastage of energy which is harnessed by making use of hybrid systems, which are a combination of solar photovoltaic and wind energy systems. By considering the factors such as wind energy, the tilt angle of PV array optimization, and inverter optimization the reliability and stability of the system has been improved. Based on this an optimal grid system configuration is designed. The cost analysis proved that the installation of the suggested system is much more cost efficient than other systems.

Vignesh M et al [2] have proposed a standalone UPS system which makes use of a solar tracking system to capture the solar energy. The main purpose behind choosing such a UPS system is that it can invert and rectify the electricity so that the solar power can be delivered to the DC part of the system instead of delivering it to an AC grid which in turn might help in avoiding the installation of excessive unnecessary inverters in the system.

Maidi Saputra et al [3] have conducted research on the comparison of the efficiency of the water pump using a battery as energy source with a pump that only uses a charged battery with solar power and wind power. The methodology that has been made used here is the comparison of the flow of water that is obtained by making use of electric pump with battery and by only using battery energy alone.

Bandla Pavan Babu et al [4] have proposed various possibilities of the design and the functionalities of a solar powered UPS which proves to be a fruitful

alternative to the electrical UPSs that are available in the market due to its high efficiency. The solar panel that is used outdoor to convert the solar energy to electrical energy and the inverter circuit that has been designed on the basis of the solar panel which converts the energy into alternating current which can be utilized for home appliances are the two main and important components in the design.

SumitWagh et al [5] have proposed research done on the utilization of the available natural resources to design a hybrid solar energy and wind energy system. The research paper mainly focuses on the study of different theories and various aspects of hybrid solar and wind system design.

Simon Rohlen et al [6] have proposed a thesis that focuses on how a UPS system can be designed which makes use of the solar power which best suits for the hospitals as to avoid the power outages during an ongoing operation which could be fatal for the patient.

Rashid Al Badwawi et al [7] have proposed a review of few challenges and solutions regarding the hybrid solar PV and wind energy integration systems. It focuses on the best way to integrate the two renewable resources into an optimum combination so that the variable nature of the solar and the wind resources can partially be resolved which in turn leads to a design that is more reliable and economically feasible to run. The studies showed that to resolve the undesired impact of voltage and frequency fluctuation on a weak grid, proper design, advanced fast response control facilities and good optimization methodologies of the hybrid systems is required.

Rizwan Arshad et al [8] have proposed research on the enhancement of the efficiency of the solar panel by making use of concentrated photovoltaic technology (CPV), which makes use of optics such as mirrors and lens that focuses the sunlight on the solar cells along with a cooling mechanism. With the usage of this technology the number of solar cells required to generate a desired output power can be reduced. The output power generated from the PV module reduces significantly at high temperature, therefore to minimize the degradation of the output power cooling mechanism using heat sinks has been employed.

HarisJawaida et al [9] have proposed a design of solar powered UPS which includes a specially designed inverter circuit and a solar panel. By

considering the requirements and specifications of the solar panel the inverter circuit has been designed in order to achieve an optimized circuit.

J.C. Osuwa et al [10] have proposed a design of a 600 watts UPS which consists of an inverter that is operated with a solar battery that is rechargeable. The inverter that has been made used is of high switching frequency and high-power handling capacity. Other electronic devices such as sensor and oscillator have also been employed in the design of the circuitry.

Martin J. Leahy [11] have proposed various methodologies that can be employed to store the wind energy that includes both large scale centralised storage and smaller scale distributed storage. Due to the variable and non dispatchable nature of the wind energy the need for backup sources of power has been increased with the expansion of wind energy generation systems.

III.PROPOSED WORK

The objectives of the proposed work are:

- To design an UPS system which is powered by solar and wind energy.
- To make use of both renewable resources, solar energy and wind energy in an efficient way to charge the UPS.
- To design a methodology that can improve the solar panel efficiency by making use of lesser number of solar panels to get the desired output voltage. Hence the number of solar panels needed for installation can be reduced and thereby reducing the installation cost.

WORKING

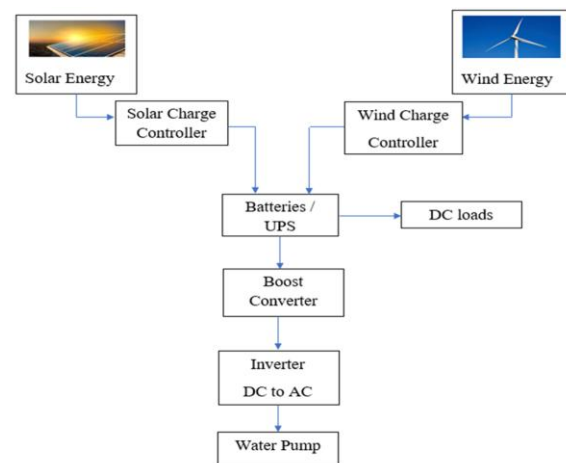


Fig 1. Block diagram

Figure 1 shown above depicts the block diagram of the overall mechanism of the proposed system and its working is explained below.

- The solar panels and the wind turbines generate power by making use of the solar radiation and wind energy.
- The solar charge controller is used to keep the batteries from overcharging by regulating the voltage and current coming from the solar panel to the battery.
- The wind charge controller protects the batteries from over charging as well as limit the speed of the rotating blades of the turbine when the batteries are full or in high wind situations.
- The batteries/UPS stores the charge got from the solar and wind energy and the DC loads can make use of this stored energy.
- The boost converter steps-up the input voltage got to a higher level that is required by the load.
- The inverter converts the stepped-up DC voltage to AC voltage that drives the water pump.

IV.CONCLUSION

On the successful implementation of the project the design would utilize the renewable resources of energy like solar energy and wind energy in an efficient way to charge the UPS. The methodology inculcated in the design would also improve the solar panel efficiency by making use of lesser number of solar panels to get the desired output voltage. Hence the number of solar panels required for installation would be reduced and this in turn would help in reducing the total installation cost of the design.

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