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Smart Controlled Grid Connected Solar-Wind System

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ABSTRACT: This paper presents a dynamic modeling and maximum utilization of renewable source like wind and solar energy etc. A monitoring system used for selecting the energy source(Renewable or Main supply). A dc-ac converter is used to integrate the renewable energy sources to the main ac bus. A direct-driven permanent magnet synchronous wind generator is used. This study considers both wind energy and solar energy changes in combination with load power variations. As a case study a 3-kW wind/solar hybrid power system dynamic model is explored. We can give supply to any infrastructure and the excess energy can be feed to National Power Grid by using a synchronizer. The proposed power system is a feasible option for a sustainable micro-grid application.

KEYWORDS: Smart Manager, Solar Panel, Windmill, Hybrid Power System

I.INTRODUCTION

In this paper a new device is introduced which we call it as a smart manager which monitor and control the entire operation of our proposed system. In this paper two renewable sources like Wind and Solar panel is used. The smart manager will check whether a sufficient amount of renewable energy is required to charge a battery. If it is available then it will directly connect it to the battery .If it not having sufficient amount of voltage to charge the battery then it will start discharge the battery up to the threshold with respect to the load. The smart manager will continuously check whether dc source is available or not. If it is not there, then as the last preference it will go for the supply from grid to charge the battery. Here we use PIC16F72 microcontroller as the smart manager.

It presents a dynamic modeling and control strategy for a sustainable system primarily powered by wind and photovoltaic (PV) energy. The proposed system is also equipped with energy storage devices, such as batteries. A utility grid connection is provided in order to replenish energy levels in case of power shortage from the renewable energy sources. Moreover, the combination of wind generator and PV modules with local energy storage devices may reduce vulnerability to natural disasters because they do not require lifelines [1].

The power systems in had the following advantages: 1) the use of the PIC reduces unnecessary redundancy of additional parallel converters in each energy source, and 2) the investment in micro-sources is recuperated because the energy sources in this power system can be used during normal operation as well as grid power outages. This paper presents a dynamic modeling and operation strategy of a wind/solar hybrid power system with a dc-dc converter in which wind energy changes and variations in the local ac load power and dispatch power to the distribution grid are considered [1]. A direct-driven permanent magnet generator (PMG) is used for the wind generator model because a direct-driven PMG has drawn attention for the residential-scale power level due to its gearless system. In addition of wind energy variations, this study also considers the rapid changing solar irradiance that may happen during the day and that affects generated power from PV modules in the proposed power system. Moreover, the here in proposed system does not require any fuel for the local sources because it is powered by inherently self sustainable energy sources [1], [2]. Thus, with enough local energy storage, it does not rely on lifelines—e.g., roads or pipes for fuel or natural gas delivery—for operation, which makes it a truly self sustainable power system ideal to provide power not only in normal conditions but also during extreme events when lifeline operation is poor or not expected. Furthermore,

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the proposed power system not only can produce electricity from the renewable energy sources but may also inject surplus power to the utility grid in normal operation.

II.SYSTEM MODEL

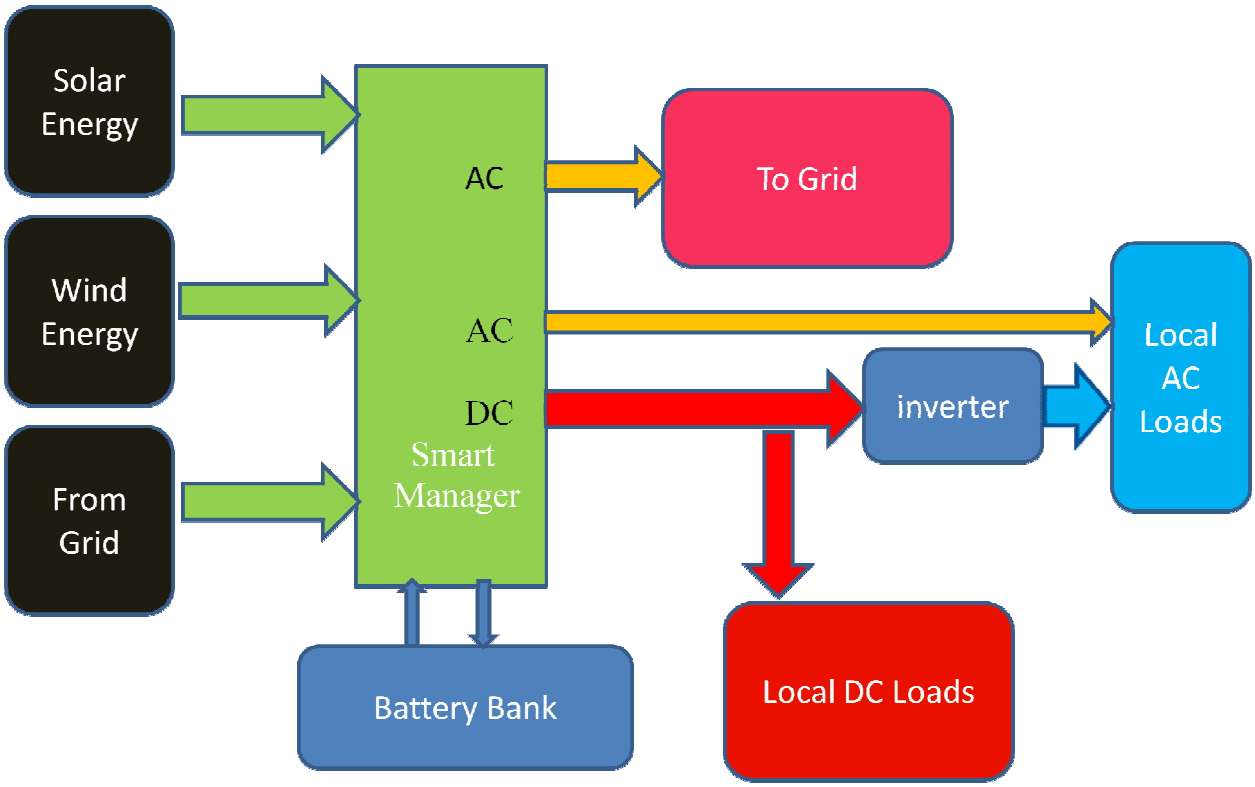

Fig:1 Block Diagram Of the System

In the fig.1, a new device is introduced which can call it as a smart manager which monitor and control the entire operation of our proposed system. In this paper two renewable sources like Wind and Solar panel is used. The smart manager will check whether a sufficient amount of renewable energy is required to charge a battery. If it is available then it will directly connect it to the battery .If it not having sufficient amount of voltage to charge the battery then it will start discharge the battery up to the threshold with respect to the load. The smart manager will continuously check whether dc source is available or not. If it is not there, then as the last preference it will go for the supply from grid to charge the battery. Here we use PIC16F72 microcontroller as the smart manager.

III.CIRCUIT DIAGRAM

In the fig.2, circuit diagram shows the hybrid power system. In the system ,two renewable energy sources wind and solar energy are used . The PIC 16F72 microcontroller is used to check whether the amount of energy getting from the renewable source is sufficient or not to charge a battery , if not then the PIC will give a signal to the relay and the system will take energy from grid by switching the relay.

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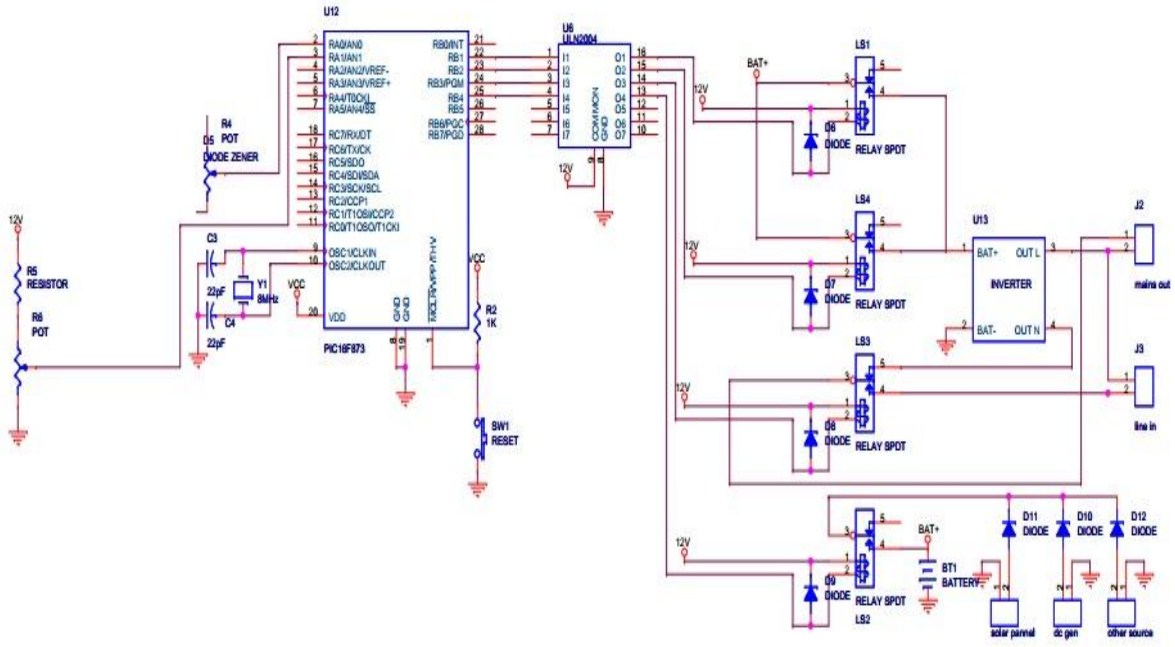

Fig.2. Circuit Diagram

Here in this system a 12 V 7Ah battery is used to store the energy to use the charge for using at the time of non availability of the resources for some time. Another function of the PIC is to monitor the amount of energy obtained and if the obtained energy is more than the demand a signal is send to another relay and the execs energy is feed to the grid.

IV.GENERATION

In this scheme, there are three source .

(1) Solar Energy :-

Here we are using a solar panel of USL Solar Module of 40 W (Type KL040) which is having Typical Peak Power (Pmax=40W) , Max.Peak Power Current (Imp=2.34A) , Max.Power Voltage (Voc=21.5V) , Short Circuit Current (Isc=2.62A) , Max.system voltage = 1000V , Max.series fuse rating=6A and having a tolerance of about +/- 10% of the typical peak power.

(2) Wind Energy:-

Here we are using a permanent magnet synchronous generator (PMSG) 12volt, 3A regulator. Since it provide rugged construction. It provides a great brush life.

V.SMART MANAGER

Here, the system contains a PIC 16F72 microcontroller to monitor the entire operation of our system. It will check the availability of resources as well as the charge of the battery. If sufficient amount of renewable source is not available corresponding to the load, then it will start discharging the battery to the load[1],[4]. If the load is increased and if the battery is draining and still sufficient dc power is not available then it will take power from the grid to satisfy the load. If the available dc power is more sufficient it will feed the execs power to the grid.

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VI. RESULT AND DISCUSSION

The system was designed and implemented for 2 bulb's and a fan. The simulation part is shown in fig.3.

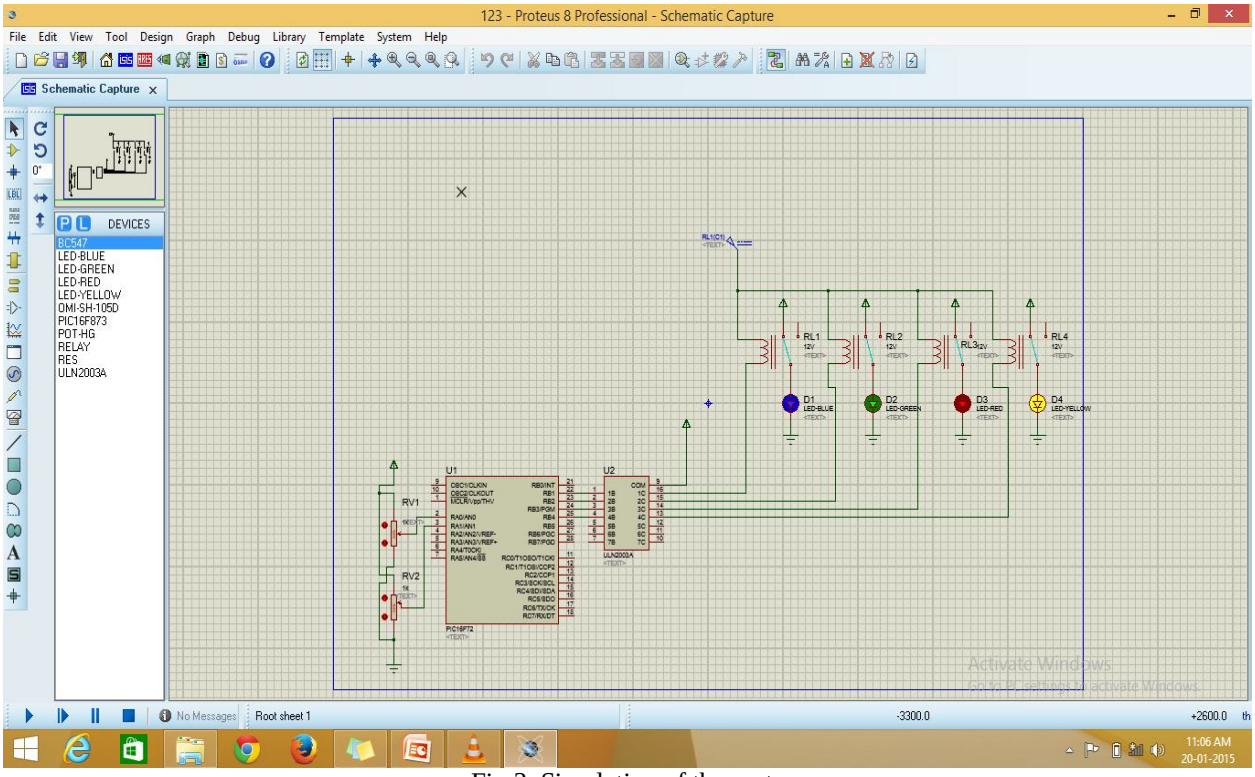

Fig.3. Simulation of the system

In this simulation ,LED D1 indicates whether the renewable energy is available or not if available the LED will turn ON. LED D2 indicates the under-voltage level of the battery ie if the voltage level of the battery goes below the threshold value, the LED will turn ON. LED D3 indicates the overvoltage of the battery due to the charging from renewable resources by turn ON the LED. LED D4 will turn on if the system is using Grid supply.

VII.CONCLUSION

When this system is compared with other sys. It can conclude that this paper has a technology to charge the battery through the grid as well as from the renewable source of energy like solar and wind. It also facilitate the transfer of excess voltage to the grid ,which is not possible in the commercial equipments[3]. Thus, it is clear that this system have a capability to save maximun utilization of grid supply as well as to save the electricity bill. This system has another advantage of adding more and more renewable resources, which is not possible in the commercial equpments. This paper can be implemented in a remote areas where the grid connection is not possible[3].

Thus it can be concluded that, this system is cost effective as well as it encourage the common people to use renewable sources like wind and solar. By using the renewable sources most effectively and efficiently, the non renewable sources can be saved for the future.

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