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ADVANCED CONTROL STRATEGY FOR STAND-ALONE SOLAR PV SYSTEM WITH DUAL SOURCE CHARGING AND ENHANCED BATTERY LIFE

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***Abstract*—**

This paper proposes a Advanced control scheme for a stand-alone PV application. A two power stage approach has been used that consists of a front end high gain DC-DC converter followed by a three phase H-bridge inverter. A general reactive load has been considered. The control scheme uses abc to dq reference frame transformation. The active power demand is controlled by regulating the dc link voltage. Reactive power is controlled by varying the inverter output voltage magnitude.

Provision for MPPT has been incorporated in the control scheme. As battery is involved due to MPPT and for providing power during the night time, special attention has been given to enhancing the battery life by ensuring that it is neither overcharged nor deep discharged. Yet, a dump load is not required to dissipate excess energy. A bidirectional converter is used to realize the battery interface with the dc link. All the analytical, simulation and experimental results of this work are included.

The Additional advantage of this system includes the Dual Source Battery Charging Method, Solar and other alternative Source. The Control System includes the Sensing device which is give the priority for Solar Source.

This system Suitable for Rural areas and hill Station. The Dual Source System we can Use Solar and Wind Energy or Solar and EB Source. The Solar Supply Available In Day Time and Wind Energy Produce the Maximum Power in Night Time.

I. INTRODUCTION

The extreme dependence of mankind on non renewable fossil fuels is leading to the exhaustion of the fossil fuels. At the same time fossil fuels responsible for the deterioration of the environment. All these factors have forced the mankind to look for alternative, environmental friendly sources. Solar Cells (PV) has emerged as a major contender to serve as an alternative energy source and is currently playing a vital role in supporting the existing conventional power generation systems.

In This System, the UPS was Charged in Dual source Method so the UPS Getting the continues input source. The availability of power based the master and slave source or the periodic charging of source is described.

This system are highly suitable Rural and hill stations, and where the continuous interruption in EB Source.

This Project include another major Advantages, there are the Improving the Battery life and utilizing the Maximum energy from Solar source. The MPPT Method are Preferred for utilizing the Maximum power utilizing.

Various MPPT techniques have been reported in the literature. Some of the popular MPPT techniques are the hill climbing perturb and observe, incremental conductance etc. Some of the MPPT schemes are more suitable for grid connected PV applications. While some are more suitable for standalone applications. The MPPT techniques using different circuit topologies are discussed. An MPPT technique using current control in a single power stage grid connected system is presented. Comparative studies of various MPPT techniques have also been performed by various researchers

The Ups System operated by the dual Source Charging system, so the Battery getting Continuous input supply when the Solar Source not available. The usage of ups increased and power output time also increased. The super capacitor used to increase the battery voltage.

II. THE BASIC BLOCK DIAGRAM FOR DUAL SOURCE CHARGING BATTERY

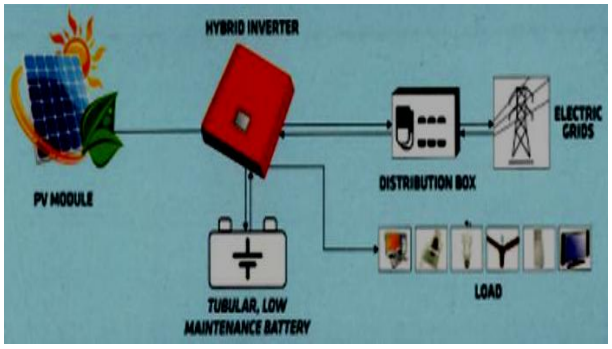


Fig 1. Dual Charging of UPS Battery, Solar Sepic Converter Panel

3.PROPOSED SYSTEM

The main power stage of the proposed system consists of a high gain, high efficiency dc-dc converter followed by a voltage source inverter, as shown in Fig. 1. The front end sepic dc/dc converter is controlled by P&O MPPT method according to the reference power, P, which is the instantaneous power demanded by the load. The block diagram showing the control of front end high gain, high efficiency sepic dc-dc converter is shown in Figure 2.

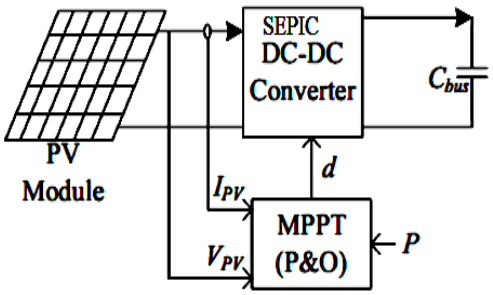


figure 2: Block diagram showing the MPPT control of the front end dc-dc converter.

The high gain, high efficiency dc-dc converter consists of one coupled inductor (L1||L2), one passive clamp network (C1, D1) and one intermediate energy storage capacitor (C2), which helps to increase voltage gain without changing duty cycle.

3.A. Maximum power point tracking (MPPT)

Most energy production or storage devices have a complex relationship between the power they produce, the load placed on them, and the efficiency of the delivery. A conventional battery, for instance, stores energy in chemical reactions in its electrolytes and plates. These reactions take time to occur, which limits the rate at which the power can be efficiently

drawn from the cell. For this reason, large batteries used for power storage generally list two or more capacities,

Solar panels have similar issues due to the speed at which the cell can convert solar photons into electrons, ambient temperature, and a host of other issues. In this case there is a complex non-linear relationship between voltage, current and the total amount of power being produced, the "I-V curve".In order to optimize collection, modern solar arrays use a technique known as "maximum power point tracking" (MPPT) to monitor the total output of the array and continually adjust the presented load to keep the system operation at its peak efficiency point.

4. STANDALONE HYBRID WIND-SOLAR POWER GENERATION SYSTEM APPLYING DUMP POWER CONTROL WITHOUT DUMP LOAD

Toshiro Hirose and Hirofumi Matsuo (2012) have presented that a unique standalone hybrid power generation system, applying advanced power control techniques, fed by four power sources: wind power, solar power, storage battery, and diesel engine generator, and which is not connected to a commercial power system.

Considerable effort was put into the development of active-reactive power and dump power controls. The result of laboratory experiments revealed that amplitudes and phases of ac output voltage were well regulated in the proposed hybrid system. Different power sources can be interconnected anywhere on the same power line, leading to flexible system expansion

The Below Block Drawing the Shows the Function of system in solar Source, in this System super Capacitor, Bi Directional DC to DC converter are ideal during the another source Active.

Fig. Simplified block diagram of Solar System. Without dual

5. Advantages:

I. High power gain
II. High efficiency
III. Continuos power flow
IV. Battery overcharging control
V. Continous battery charging
VI. The Super capacitor used to increase the battery life

6. Features in advanced methods.

Proposed system consists of a high gain, high efficiency SEPIC dc-dc converter followed by a voltage source inverter in the main power stage.

Battery storage and super capacitor is interfaced with the dc link through a high gain, high efficiency bi-directional dc-dc converter .

The dual source option used to utilize the continuous power output. The ups will be functioning the both time and day and night hours.

The Dual Source Charging system is the Optional one, depending upon the alternative source it may be a Wind or TNEB Source the Controlling System can design. In this Circuit not consisting the Source Selection system, the same can design either NO NC method or Microcontroller Based source Selection. Depending upon the need and application we can choose the system. This system designed as per the dual source adding provision.

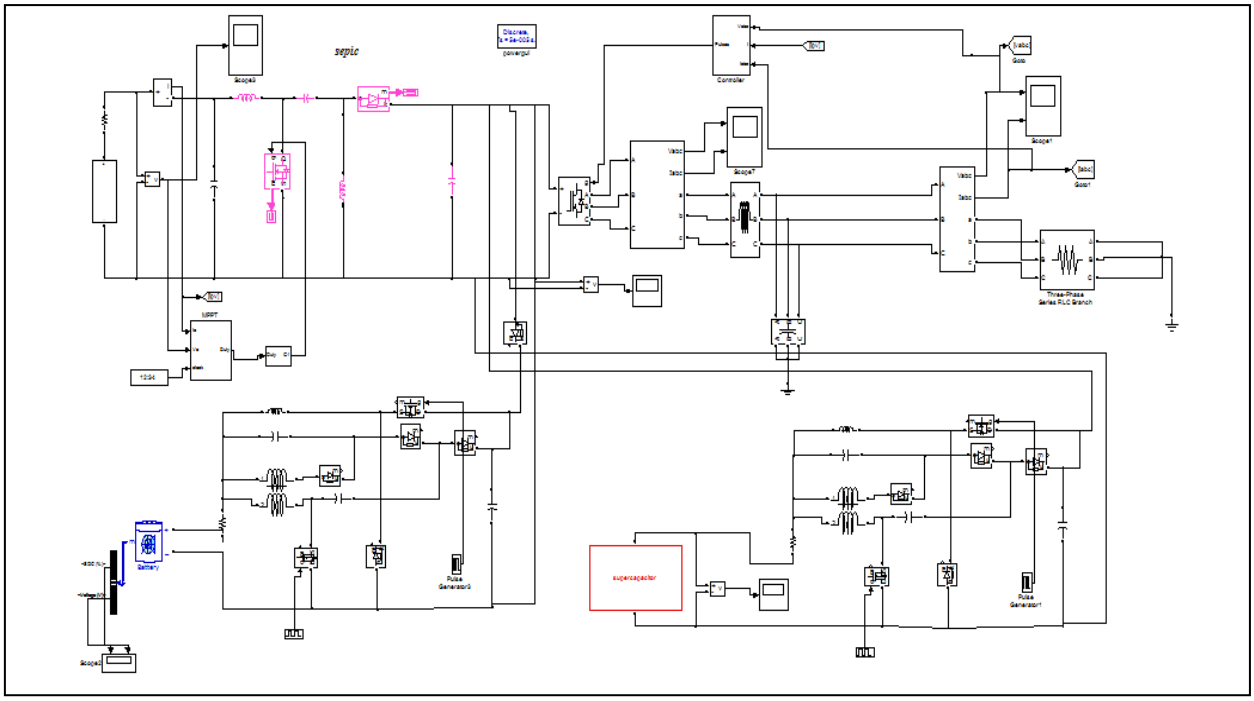


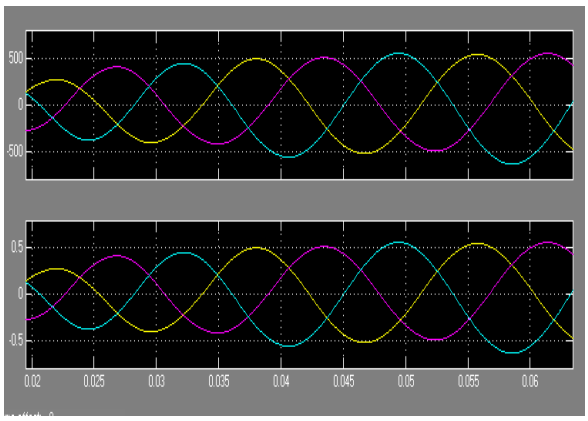
Figure: 5. Simulation Drawing for advanced control strategy for PV system with enhanced battery Life

Figure: 5, Mat Lab Circuit for PV system with UPS

1. **PV – Output Voltage**

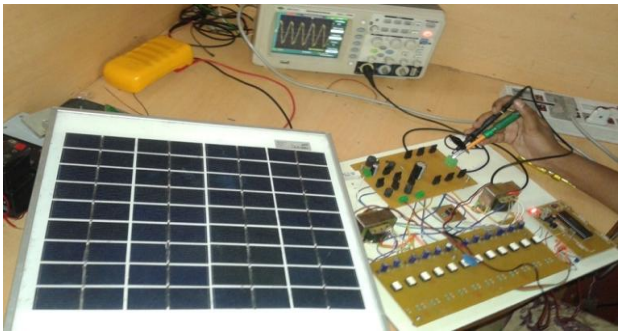
Output Wave form.

. It is anticipated that this hybrid power generation system, into which natural energy is incorporated, will contribute to global environmental protection on isolated islands and in rural locations without any dependence on
commercial power systems.



Figr:6, Three output Voltage

Figure: 7. Solar PV System Output Voltage.



7.B.Hardware Kit Photo

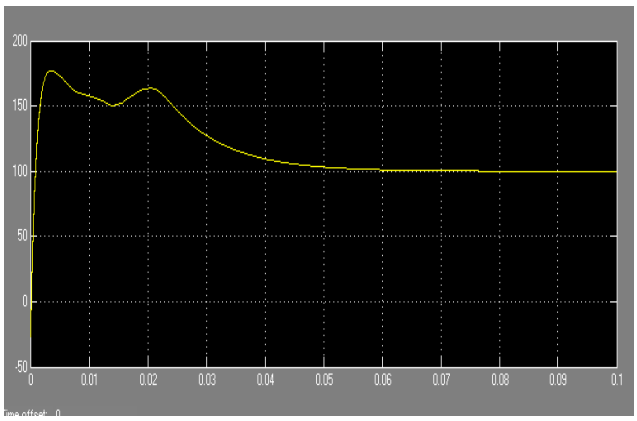


Figure: 8. Solar PV Cell, epic Converter,Pic,Battery.

CONCLUSIONS

The control strategy proposed in this paper is able to extract the PV power according to the load demand. This obviates the need for a dump load, where it is very difficult to regulate dump load requirements with the change of solar irradiation and other operating conditions. This control
Strategy is also suitable for islanded mode of operation of a grid connected system. Instead of only one PV source other renewable energy sources can also be used to form a hybrid source system. The proposed system can be used with solar PV, fuel cell stack as a hybrid source and ultra capacitor bank to meet the transient power demand to make a highly efficient system with good dynamic response.

A comparison of existing control techniques for stand-alone load and Dual Source Chraging with the proposed control technique is added advantage of this System.

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