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Solar Powered Energy Efficient Distriution System

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Abstract:
The solar energy is the most abundant source of energy on the Earth. Solar energy systems based on photovoltaic (PV) cells have attracted considerable interest in recent years. Solar energy systems based on micro-inverter architecture are gaining in popularity. The micro inverters are single stage flyback inverters that are based on DC-DC flyback topology. A solar cell with an efficiency of 40% could generate up to 1MW. This session discuss about the advantages, disadvantages of using a flyback converter on a smart solar grid system. Unlike other non-renewable resources this source of energy is non pollute. Solar energy are hygienic energy. In recent PV inverter technology, the easy and the low-priced advantage of the flyback topology is promoted only at very low power as microinverter. Therefore, the primary objective of this study is to design the flyback converter at high power and demonstrate its practicality with good performance as a central-type PV inverter. Solar energy is widely accepted around the world. This paper mainly focuses on transferring of excessive energy from solar panel to the grid using a flyback converter.

Keywords: *photovoltaic inverters, MPPT,Perturb and Observe Method*

I. INTRODUCTION

The solar energy is considered as one of the most renewable and freely available source of energy and the candidate to play a greater role in the energy market of the world in the near future. The high cost of the technology still limits its usage worldwide. The low cost is really essential for commercialization especially in small electric power systems including the house hold applications. The photovoltaic (PV) inverter technology with flyback topology at high power can be a low-cost alternative to the commercial isolated grid-connected PV inverters in the market.

II. FLYBACK TOPOLOGY

The flyback converter is derived from buck-boost topology with a mutually-coupled inductor that forms the transformer. The transformer provides a voltage ratio from input to output and the advantage of galvanic isolation. It is recognized as the lowest cost converter among the isolated topologies since it uses the least number of components. This advantage comes from the ability of the flyback topology combining the energy storage inductor with the transformer. The combination of these two components in a flyback topology eliminates the bulky and costly energy storage inductor and therefore leads to a reduction in cost and size of the converter. The cost depends on the implementation as much as the selected topology, so not every implementation of the flyback topology leads to a low-cost converter. For this reason, as we try to achieve the high-power implementation of the flyback converter with good performance

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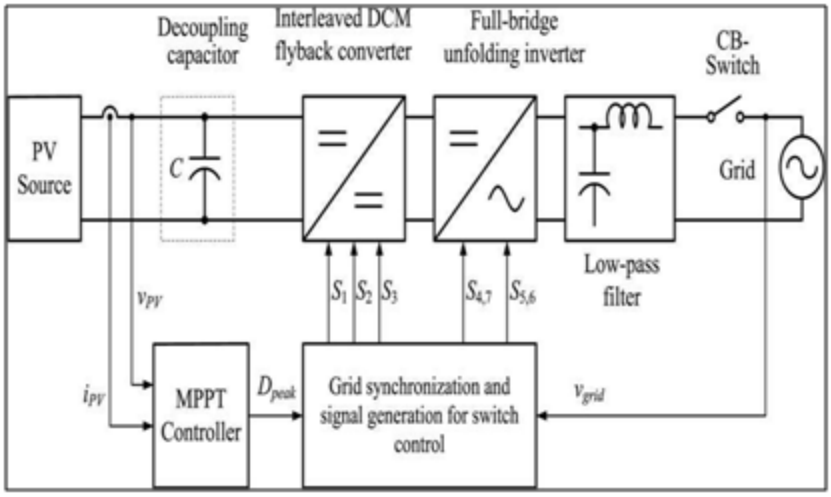

Figure.1 Block Diagram

III. BLOCK DIAGRAM EXPLANATION

The PV supply is applied to a three-cell interleaved flyback converter through a decoupling capacitor. All flyback converters use a Metal–Oxide–Semiconductor Field-Effect Transistor (MOSFET) for switch at the primary side, a flyback transformer, and a diode at the secondary side. The topology also has to use a full-bridge inverter and a low-pass filter for suitable interface to the grid. S1,S2,S3 are the flyback switches turned ON, current flows from the common point (PV source) into the magnetizing inductance of the flyback transformers, and magnetic field energy was stored. When switches during on time, no current flows to the output due to the position of the secondary side diodes. as a result, energy to the grid is supplied by the capacitor and the inductor. After the flyback switches are turned OFF, the energy stored in the magnetizing inductances is transferred into the grid in the form of current. Hence the flyback inverter acts like a voltage controlled current source.

A MPPT controller is the charge controller embedded with MPPT algorithm to maximize the amount of current going into the battery from PV module. MPPT is a high frequency DC to DC converter which operates by taking DC input from PV module, changing it to AC and converting it back to a different DC voltage and current to exactly match the PV module to the battery. MPPT solar charge controller allows users to use PV module with a higher voltage output than operating voltage of battery system.

Traditional PV modules perform MPPT for the entire PV array as a whole. In such systems the same current, dictated by the inverter,flows through all modules in the string. Because different modules have dissimilar I-V curves and dissimilar MPPs some modules will be performing below their MPPT, follow-on in lesser efficiency.

This paper places maximum power point tracker into individual modules, allowing each to operate at peak efficiency despite uneven shading, soiling or electrical mismatch.

IV.MATLAB SIMULATION

In our paper the MATLAB with version 2010 of R 10A is adopted to produce the simulation results. In the simulation sector the working of flyback converter and inverter is explained clearly using MATLAB R10A .Here, the simulation results are shown for Mosfet pulses for converters, flyback converter output, Mosfet pulses for inverter and inverter output.

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V.SIMULATION OUTPUTS

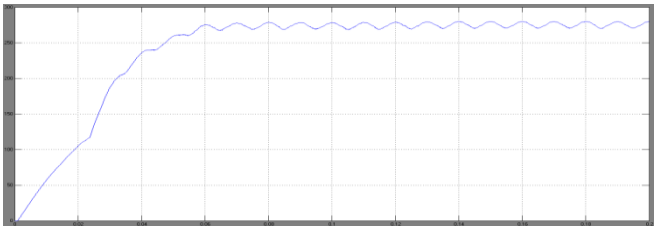

Figure.2 Simulation of output Voltage from PV Source

The output voltage waveform of a PV Source is simulated above. Y-axis is the voltage and X-axis is the time. The output voltage remains constant once radiance and heat reaches its rated level. Hence obtaining DC output.

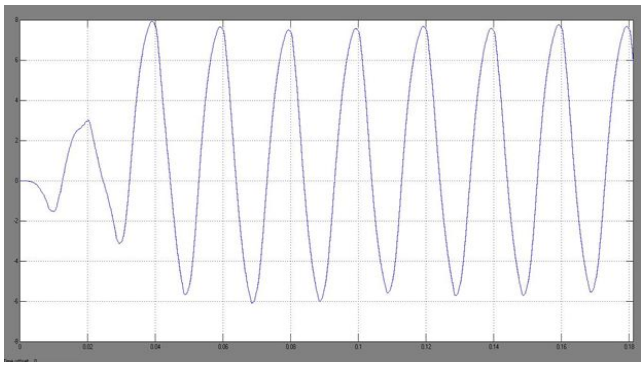

Figure.3Simulation of output Current with filter

This output is taken across the output terminals of the filter. The resultant current waveform is sinusoidal one. The output current is in the range of 6-8 Amperes when the input voltage is 12V.

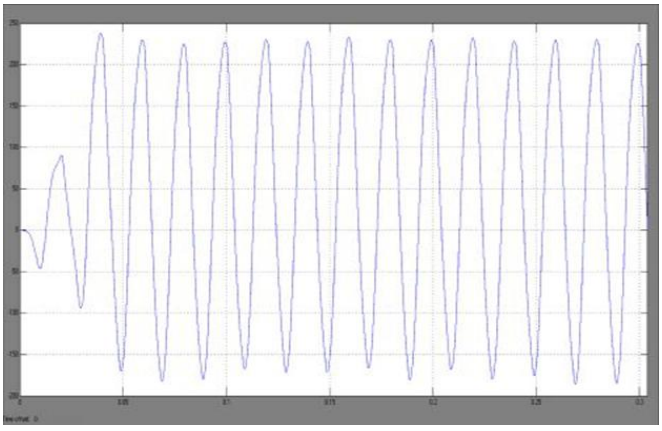

Figure .4Simulation of output voltage with filter

This output is taken across the output terminals of the filter. The resultant voltage waveform is the expected sinusoidal wave form expected sinusoidal wave form

Figure5.Simulation of pulses for MOSFET Switches

The above pulses are given to the MOSFETS. These pulses are generated based on Duty cycle which is obtained from the MPPT and based on the grid voltage.

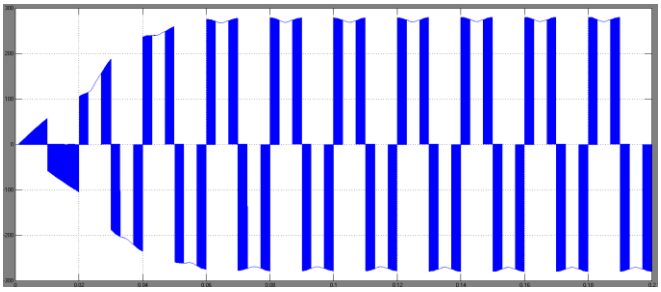

Figure.6 Simulation of output voltage without filter

The above output voltage waveform is obtained without filter. This waveform is taken from the output terminals of the inverter. The waveform has ripples due to switching operation of the MOSFET.

VI. PROTOTYPE MODEL

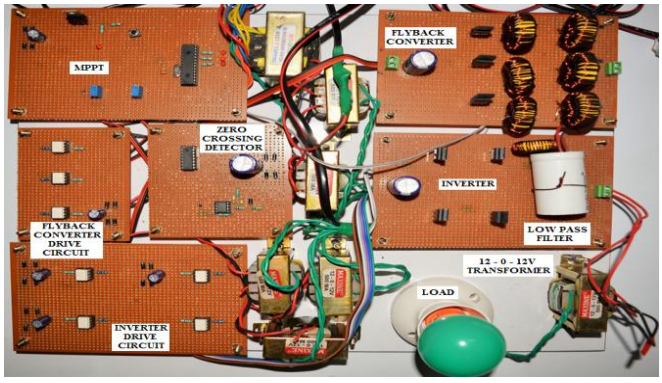

Figure.7 Proto type model

VII. CONCLUSION

In this paper Flyback converter is implemented which produced a pulsating DC voltage as output. Our paper can be used for high power applications to get optimum output. In our paper the panel input may be completely utilized completely. A Decoupling Capacitor is designed and implemented which helps to compensate the voltage when voltage fluctuations are caused when disturbances occur at PV source. A single Phase inverter which converters the pulsating dc into ac is also designed and implemented. A low pass filter is properly designed and implemented. This combination of converter and inverter is used to run house hold applications. This paper deals with the efficient power generation from non conventional sources.

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