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A High Voltage Ratio Three Stage Cascaded Interleaved Boost Converter for E Vehicle Applications

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ABSTRACT: Development of photovoltaic applications with highly reliable and efficient converter and inverter equipped with advanced control strategies made the photovoltaic system more compatible for high power ratings. Solar PV modules are interconnected in this project to generate abundant electrical energy which is connected to an interleaved boost converter and the load is evacuated by the energy. The characteristics of an interleaved boost converter are controlled using maximum power point tracking (MPPT) to maintain the constant output. In recent days power demand is increasing day by day. The renewable energy sources provide a great solution to overcome this problem. The main theme of this project is to use renewable energy sources from solar power to run electrical appliances. Power generation using natural resources reduces the cost of power systems. Electrical energy is generated by the use of solar panels. Voltages from the solar panels are controlled by the use of multiphase boost converters. Interleaved boost converter is connected to the solar panel output. It increases the voltage that is equivalent to the battery charging voltage. Voltage from solar is calculated by the use of voltage measurements.

KEYWORDS: Solar PV modules, Interleaved Boost Converter, Maximum Power Point Tracking, Renewable Energy Resources, Multiphase Boost Converter.

I.INTRODUCTION

The most worrisome effect is greenhouse gasses which are caused because of the transportation sector. The prominent solution for this effect is Electric vehicle (EV) technology. Various studies were conducted to increase the life of the battery and to increase the long run operation to eliminate the issue of limited and constrained power in the battery of Electric vehicles. The components and control strategy are not only the limited components of an EV system. The other means of improvement of the EV is the charging strategy in the transportation sector. During the peak demand duration, the issue of electric burden will increase. To overcome this drawback of charging the EV we require certain methods. The direct influence of generation, transmission and distribution of the power is implemented by an interleaved DC charging solar system applied for the electric vehicle transportation technology. The best option for electrification is the OFF grid or the standalone charging system. It eliminates the need for connecting charging utilities like transmission and distribution. Remote areas gain more benefits from the renewable energy resources as they meet the power needs. Solar power, wind energy, water and geothermal are the most common renewable energy sources. To meet the power crisis issues and suggest clean, economical, sustainable power resources the solar charging seizes the researcher's attention. The proposed application of power charging causes many issues as they are solely based only on

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the solar energy system. The photovoltaic combined with the power grid system and photovoltaic standalone charger are an excellent method for solar energy which has been proposed. To increase the conversion efficiency of the PV array both the power grid system and the PV standalone charger are required to make it a suitable converter because the efficiency of the PV array is small when compared to the capacity of the battery storage. To make this application more optimized conventional boost converter is used.

The photovoltaic cells supply maximum power based on the atmospheric condition particularly at the maximum power point. Maximum power point is more desirable to operate in a PV system than the conventional power sources. Depending upon the photovoltaic array's temperature and the isolation intensity the maximum power point locus varies over a wide range. Maximum power point locus is also affected by the instantaneous shading of the panel and the aging of PV cells. Due to the load's electrical characteristics the problem is further complicated. The network which matches the time and interface with the varying source and the load varying with potential is required to achieve the maximum power point operation. This matching network is called the MPPT. At the changing atmospheric conditions and load variation the operation of MPPT ensures. The pulse width modulated is most commonly used in the dc - dc converter in the front end at the MPPT power stage. In standalone operation the entire power stage is constituted by the pulse width modulated and dc link capacitor is used in the grid connected.

II.METHODOLOGY

Conventional boost converter is used to increase the input voltage and it is used because of its low cost, low conduction loss and compact structure. Maximum power point tracking scheme is used to get a high, fast and stable tracking efficiency of the photovoltaic cell.

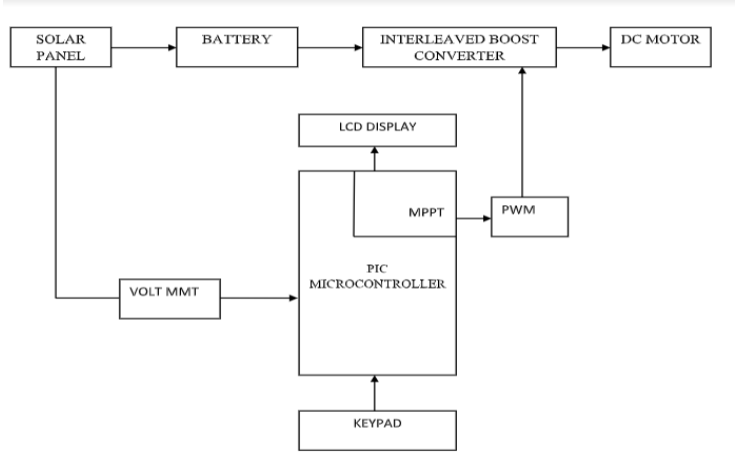

Figure 1: Block Diagram of Proposed Method

Maximum power point tracking is used to get maximum possible power from one or more photovoltaic devices or solar panels and it is a technique that grids connected battery chargers, inverters and similar devices. There is a relation between solar irradiation and the temperature for the solar cells. The nonlinear output efficiency can be analyzed by the I-V curve which is produced by the total resistance. An entire array is used in the traditional solar inverters. Same amount of current will flow through all the panels. Some panels will perform below its maximum power point and it will lead to loss of energy. Hence different panels have different IV curves due to its tolerance, partial shading and manufacturing. Nowadays peak power point converters are placed in individual panels in many of the countries. Hence each panel is allowed to operate at a high efficiency even though shading, soiling or electrical mismatching.

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An OFF-grid PV power system uses a battery to supply load at night time. The PV panel's maximum power point voltage is equal to the fully charged battery pack and it will be true while at sunrise whereas the battery is discharged partially. When the voltage is below the PV panel maximum power point voltage the charging begins and the mismatch of the voltage is resolved by the MPPT. The MPPT can no longer operate the solar panel when the battery in the off grid is fully charged and the production from the PV exceeds the load because it cannot absorb the excess power. Until the production exactly matches the demand the MPPT shifts the solar panel operating point away from its peak power point. The power delivered from the solar panel will be delivered to the grid in the grid connected photovoltaic system. Hence the MPPT always operates the PV panel at its maximum power point in the grid connected photovoltaic system.

III.RESULT & DISCUSSION

In the software sector, Matlab version 7.10and Windows XP operating system are the major software requirements. For technical computing MATLAB is a high-performance language which integrates with computation, visualization and programming. It is an interactive system in an array and it does not require dimensioning. It allows us to solve many technical computing problems. Several auxiliary tool boxes are included in the Matlab which is distributed by Math works. It also includes system identification tool boxes to process the experimental data and to test various models at optimizing values.

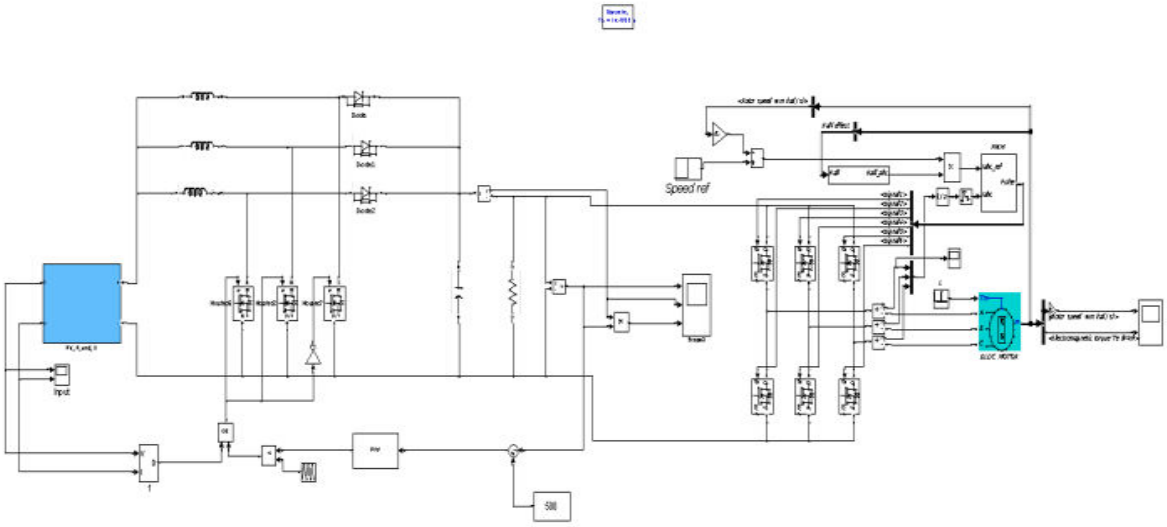

Figure 2: Simulation diagram of the interleaved boost converter to charge evehicle

Figure 2 shows the simulation diagram of a three-stage interleaved boost converter for PV application to charge vehicles. Figure 2(a) shows the output voltage and current from the solar panel and Figure 2(b) shows the current, voltage and power from the interleaved boost converter and the figure 3(c) shows the output speed and torque from the motor

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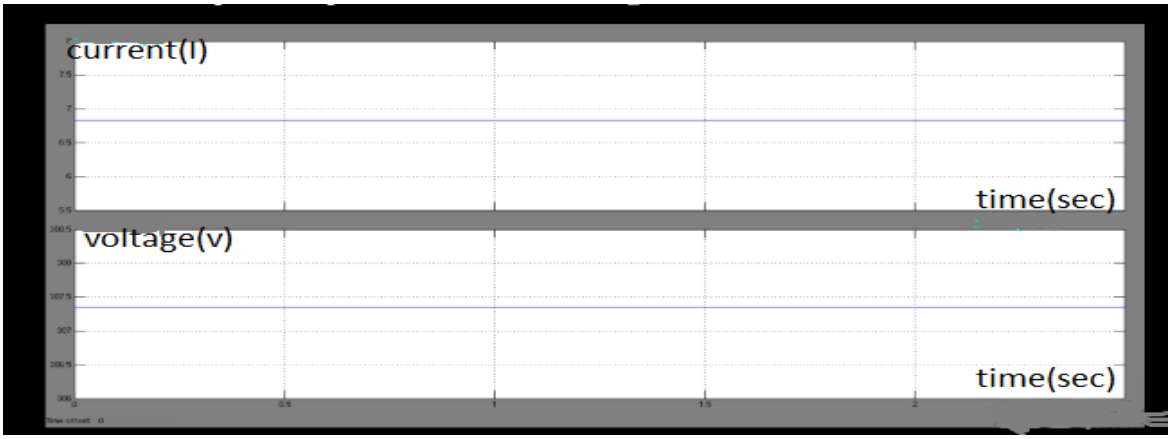

Figure 2(a): Shows the Output voltage and Current from the Solar Panel

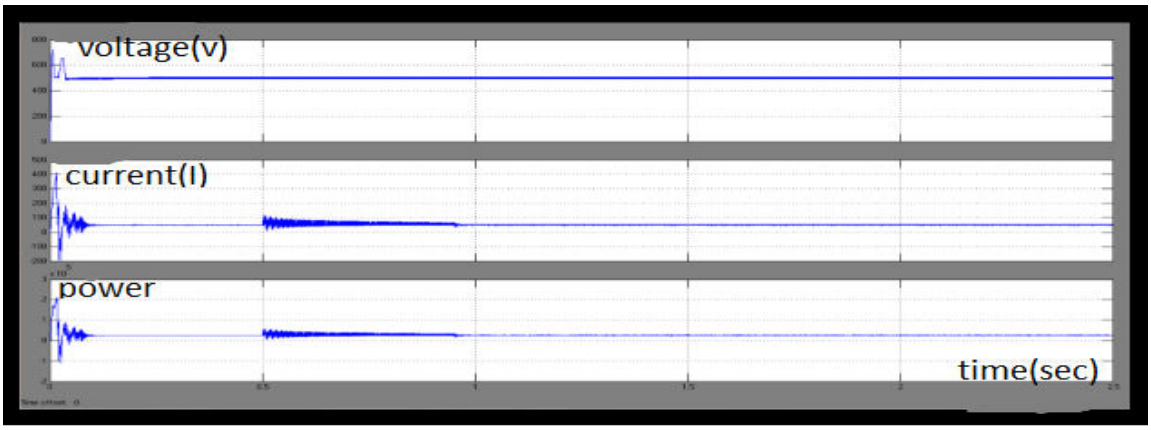

Figure 2(b): Shows the Current, Voltage and Power from the Interleaved Boost Converter

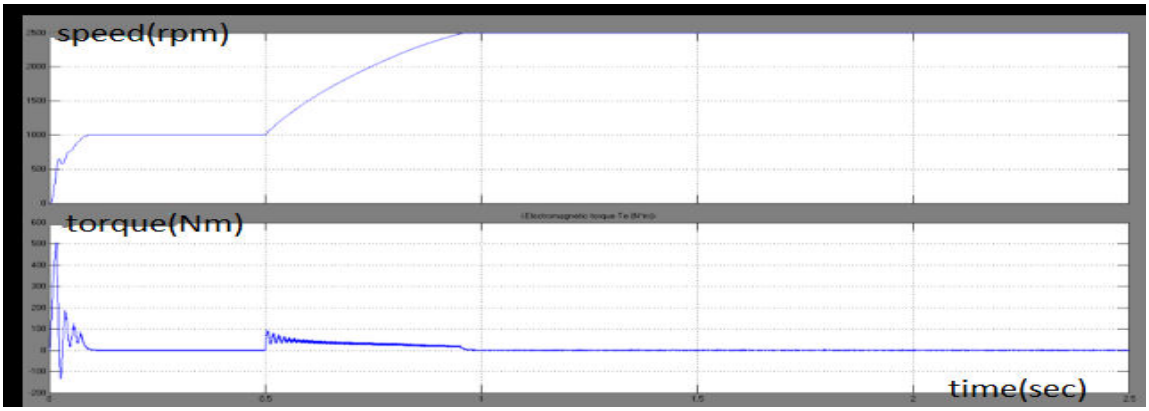

Figure 2(c): Shows the Output Speed and Torque from the Motor

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IV.HARDWARE IMPLEMENTATION

A high voltage three stage interleaved boost converter is an electric vehicle charging powered by solar energy. It avoids the use of petroleum products and it is capable of fully automated charging without the need of human interaction. The system uses 12V batteries to power the vehicle movement. We also use a solar panel to charge the battery so that there is no need to charge it externally. The vehicle motor and the interleaved boost converters are interfaced to a PIC microcontroller that controls the working of motors. The rate of electric vehicles is controlled by a controller, which guarantees the electric vehicle security, which is done by a PIC microcontroller. In order to provide an efficient acceleration of an electric vehicle, we use a DC gear motor. The results confirm that petrol and diesel can exist for the current scenario, so future scope depends only on electric bikes. The solar panel gives power to the interleaved boost converter. The interleaved boost converter consists of three stages to increase the input power from the solar panel. The boost converter is used for the step up the voltage and the power goes to the battery. The battery gives power to the DC gear motor. The DC gear motor runs at a speed which is connected to the vehicle. Today available electric vehicles use three or more 12V batteries. But in this system, we use only one 12V battery, so battery cost is reduced. Vehicle is man operated and it is easy to use by all. The need is to use it in the required place. It can be controlled by speed and we get the required output voltage by giving reference voltage, so it can be used in the required place. This project helps to make a pollution free vehicle for transportation. The components are cheap and available.

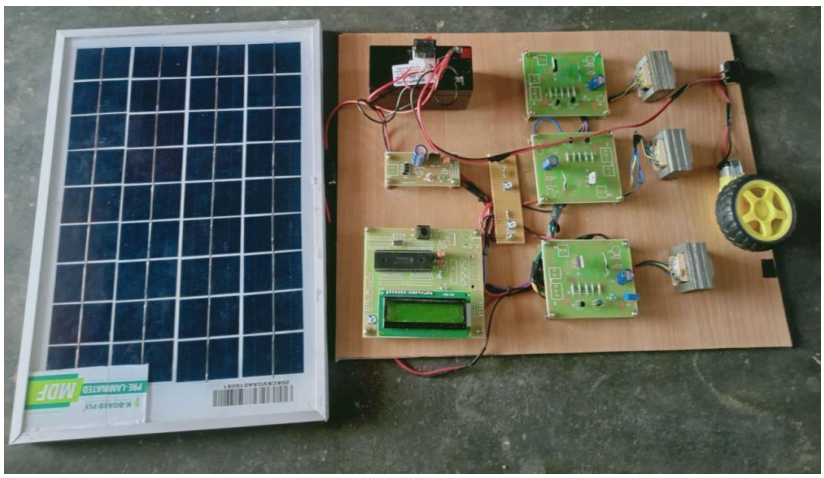

Figure 3: Hardware Implementation to charge Electric vehicle from Solar Panel

V.CONCLUSION

In this paper, the electric vehicle battery is charged by the use of an interleaved boost converter. One of the nonstop processes is the progress of science and technology. Many new things and new technologies are invented day by day. Technologies are growing day by day and they will occupy every place in future. The proposed system is based on the peripheral interface controller and it is found due to its compact size. It will perform many tedious and repetitive tasks. For commercial and research applications the purpose for this is extended day by day in the industrial service. The hardware used in this circuit design is less and it is fully controlled by the software due to the high probability of technology. This system is used in the feature because of its feature. This makes our future a bright and well sophisticated world.

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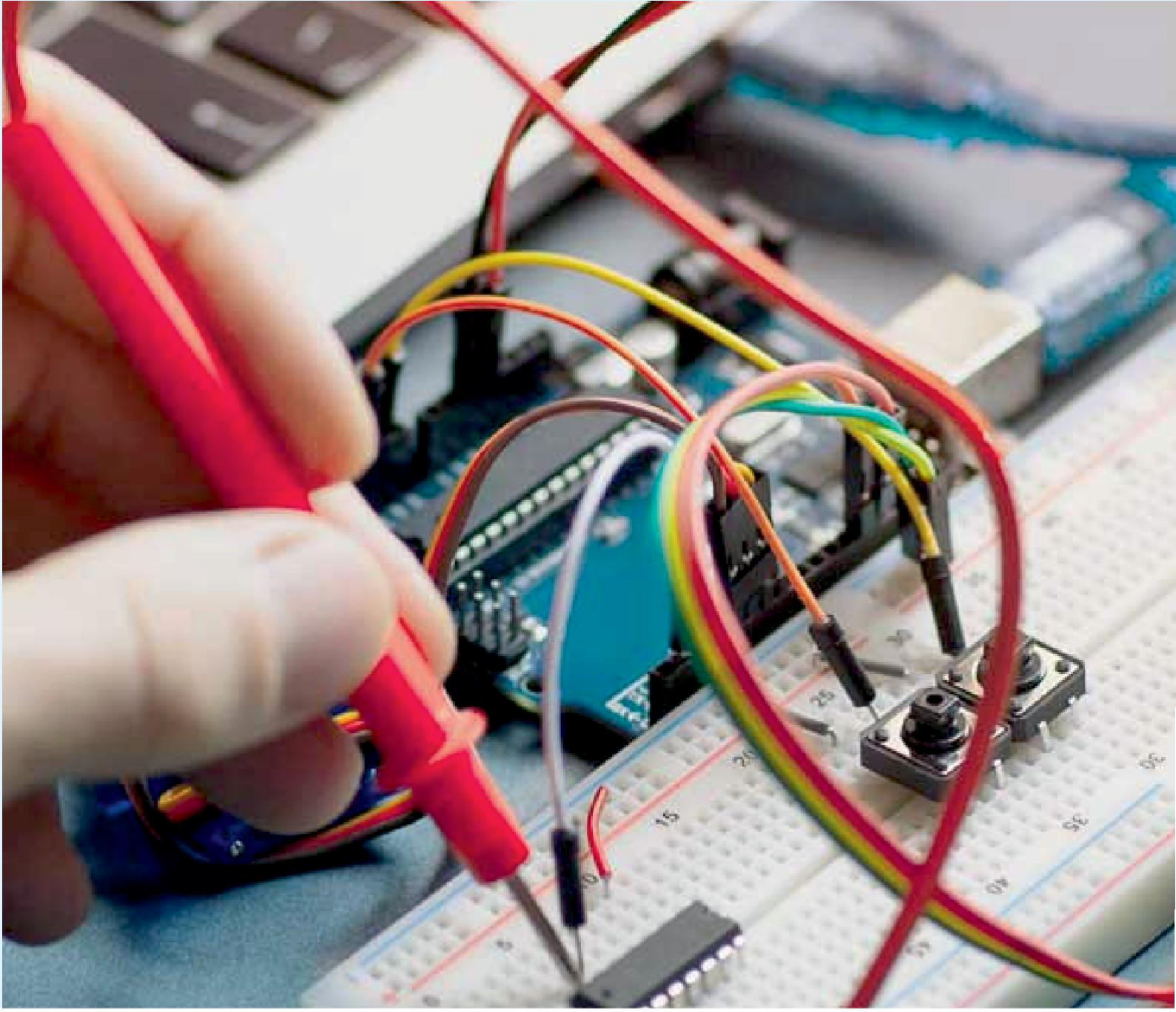

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