Abstract— With the help of renewable energy source generation of power increased day to day. Renewable energy sources are more available in nature and these sources are free from the pollution to the environment. In solar system sun is the most important source of renewable energy and produce energy in the form of heat and light by using this energy power can be generated with the help of PV panels the output of the PV panel are fed into the converters and rectifiers, simultaneously by using inverter get the AC power. In this project represents the topic on getting multioutput by using single input. to get the dual output voltage level from the conventional converters by using the more number of switches and elements because of that power loss will be more and system becomes complex. Hence, SEPIC based dual outputs converter is used which is suitable for solar applications. By using the modified SEPIC converter we get the dual output, the output are used to charge the two batteries then output of the battery will be provided to the cascaded multi-level inverter finally get the AC output. Compare to the other multilevel inverter proposed system is simple and an operation was easy to understand.

Key words: Multi-Output SEPIC Converter; DC/AC Converter; Cascaded H-Bridge; PV Panel, Renewable Energy

I. INTRODUCTION

From the last 30 years demanding for the energy will be increases rapidly, lot of researches have been done to make renewable energy (RE) more favorable. Less availability of fossil fuels and to avoid the effect of greenhouse gases are few of encourages factor leads to fast progress in the conventional and renewable energy research. Even though initial cost is high in some of the countries, institutions started on Rebased electric generation projects for economical purposes. In most conventional energy power Application, an inverter can be used to convert the DC-AC. This is because conventional power output like solar, wind, tidal and biomass are in dc form, while the electrical transmission systems is based on AC. And inverter can be used in energy saved application like heating and cooling systems. A Solar panel modified dual output SEPIC converter is implemented in this project.

Shortage in fossil fuels and concerns over global warming due to greenhouse gases are some of the stimulating factors lead to rapid progress in alternatives and renewable energy (RE) research. RE sources are more sustainable due to their natural abundance and environmental friendly nature. Despite the higher initial investment cost, quite a significant number of countries, companies and organizations have started on Rebased power generation projects for commercial purposes.

Photovoltaic (PV) stand-alone systems require energy storage battery charger hence the design and implementation of photovoltaic systems modeling and charge controllers in a SEPIC is described [2]. The aim is to control flow of power from the Photovoltaic system so it balances the PV power which is effectively used and the battery will be charged. Detailed modeling of PV system input and Maximum current mode controller is explained in this paper.

With the increasing attention to energy problems, the implementation of renewable energy sources is becoming widely used. The paper [3] explains wind and photovoltaic power generation technologies and its Maximum power point tracking method. Thus independent wind and solar power generation system is implemented which is suitable for urban areas. In wind power branches, the newly introduced dual- excitation permanent magnet brushless machine for flux control by using online capture maximum wind energy. For photovoltaic branch, single-ended primary inductance converter by adjusting the duty cycle using the maximum solar power.

The paper [1] describes the purpose of simplifying the power supply system to reduce the cost of proposed hybrid grid photovoltaic and wind power generation Applications. The implemented multi-input inverter comprises buck and buck - boost combined input DC - DC converter, and DC-AC inverter circuit. In this paper described the Operation of Multi-Level inverter circuit.

Electric vehicle powered by a fuel cell (FC) is given a more desirable property. Fuel cell is a type of sanitary energy, and has a maximum energy storage capacity. However, Fuel cell has a slow but non-static response. During startup and transient conditions require a secondary power supply. Super capacitors can be used as secondary power supply, Increases the demonstration and efficiency of the system. The paper [4] presents a super capacitor as a secondary energy storage system is connected to the fuel cell electric vehicles converter systems. Bi-directional DC to DC converter is an interface to connect the super capacitor energy storage system to the FC. Design and dynamic evolution of the control based on the controller to implement the converter system. The simulation and analytical results gives that proposed technique is Applicable for controlling bi-directional DC to DC converter.

The paper [6] author describes and analyzes why a separated SEPIC converter is the perfect selection for photovoltaic systems. Advantage of this system is it gains High voltage, and voltage stress on the switch is same as a basic SEPIC converter. The modes of operation have been discussed here by considering Design Parameters.

In a multi -level inverter, cascade H-bridge converter is considered the most preferred form of the converter. But the level of yield voltage of the converters as a staircase in these increased levels of DC power requirements have increased, thus limiting its application. The paper [7] attempts to develop than conventional cascade multilevel converter cascade converters, the need to reduce
the number of DC voltage source to increase the output voltage level of the modified version, in order to solve the above problems.

In the paper [5], the proposed 1-phase H-bridge multi-level converter through the fuzzy logic controller (FLC). New system is completely FLC and H-bridge power sharing flow chart used. The system and the actual situation in a wide range of general structure of its main performance will be showed. The implemented system provides increased working efficiency over the dual-level inverter, especially in minimum and moderated power.

II. BLOCK DIAGRAM

A. DC-DC Multi-output SEPIC converter

The Fig. 1 shows the block diagram of the proposed system. The topology consists of PV panel, modified SEPIC converter, voltage sensor, digital controller, battery storage, multilevel inverter and load.

Fig. 1: Block diagram of the proposed system for power generation.

The modified converter is fed from the PV panel which produces dual output. With the help of controller, the output voltage is maintained a constant value. This voltage will undergo the process of constant voltage charging for the batteries. These batteries supply a constant output voltage which feeds the multilevel inverter, which is intended to obtain five levels of output AC voltage.

II. MODES OF OPERATIONS

1) Mode 1

SEPIC converter can be modified into isolated converter as shown in fig 4.2 and can be described as; a step up transformer is intended for isolated converter with the capacity to deliver various outputs. By having two inductors L1 and L2 for a traditional converter and by changing L2 with a separated step up transformer having one essential and two optional windings, an adjusted multi-output SEPIC converter is developed. The two windings are joined by a rectifier and a filter capacitor. At the point when the circuit experiences two operation modes by turning on and off the switch S, gives consistent DC output V1 and V2 crosswise over R1 and R2.

B. Modes of operations

1) Mode1

SEPIC converter can be modified into isolated converter as shown in fig 4 and can be described as; voltage step up transformer is intended has a separated converter with the capacity to deliver various outputs. Where L1 and L2 are the inductors in a traditional converter and L2 is a inductor by changing the winding of the L2 with the help of separated step up transformer has 1 essential and 2 optional windings, an adjusted to develops the multioutput SEPIC converter. By using rectifier and a filter capacitor both the windings are combined. At that point the circuit experiences two modes of operation by turn on and turn off the switch S, gives consistent DC output V1 and V2 crosswise over R1 and R2.
The multi-level inverter is shown in Fig. 5. The eight switches act in accordance with switching sequences as per Table 1 to obtain five levels, namely 0V_{dc}, ± V_{dc}, ± 2V_{dc}. Pulse patterns show in the below table.

<table>
<thead>
<tr>
<th>Switches turn on</th>
<th>Voltage level</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1,S3,S6,S8</td>
<td>0V_{dc}</td>
</tr>
<tr>
<td>S1,S2,S6,S8</td>
<td>+V_{dc}</td>
</tr>
<tr>
<td>S3,S4,S5,S7</td>
<td>-V_{dc}</td>
</tr>
<tr>
<td>S1,S2,S5,S6</td>
<td>+2V_{dc}</td>
</tr>
<tr>
<td>S3,S4,S7,S8</td>
<td>-2V_{dc}</td>
</tr>
</tbody>
</table>

Table 1: Switching Pattern For Five Level

The multi-level inverter is shown in Fig. 5. The eight switches act in accordance with switching sequences as per Table 1 to obtain five level levels, namely 0V_{dc}, ± V_{dc}, ± 2V_{dc}. Pulse patterns show in the below table.

The system will provide the 230V AC input supply. The output of the converter is made to determine the assistance of controller which will trigger the pulses for the converter and is fed to a battery which gives the steady Direct Current supply to multilevel inverter. And the Battery storage gives power when there are power outages.

The system will provide the 230V AC input supply. The output of the converter is made to determine the assistance of controller which will trigger the pulses for the converter and is fed to a battery which gives the steady Direct Current supply to multilevel inverter. And the Battery storage gives power when there are power outages.

E. Design of Main Circuit

Design of main circuit parameters are listed below
- Supply voltage of 48V and current 2.2A.
- Switching frequency of 50 KHz and duty cycle of 47% for multioutput SEPIC converter
- The step up transformer is designed with the parameters of DC output voltages of 160V and current of 0.74A in the primary side
- At the secondary side of the transformer having voltage of 160V and a current of 0.6A.

Final output of the system is 230 volts and 0.74A.

F. Open Loop Circuit Simulation and analysis

The proposed circuit developed for an input dc voltage of 48V and current 2.2A. The switch S in the SEPIC converter operate at a frequency of 50Hz and duty cycle of 47% here step up transformer is used to step up the voltage and to provide the isolation we use the SEPIC converter. The design parameter of the transformer are as follows: The output dc voltage of 160V and the current is 0.74 A in primary side at the same time in secondary side we get the output voltage of 160V and the current is 0.6A, the output from the secondary
of the transformer is fed into the Multilevel inverter to produce the output voltage at the end is 230V and the current of 0.74A. The open loop simulation of the main circuit in MATLAB software is given in Fig.9.

Fig. 9: open loop simulation circuit

Fig. 10: Input voltage at the primary side of the transformer (V1)

Fig. 11: Multi-output converter output voltages (V01, V02)

Fig. 12: Gate pulses for switching of the multilevel inverter

Fig. 13: five level Output Voltage at the Multilevel Inverter

G. Closed Loop Circuit Simulation

If any variation in the load we use the closed loop simulation instead of open loop hence we get output of SEPIC was given to the regulator to produce the five stepped output of 160 voltages. Here output of the open loop simulation voltage not a constant so we use the closed loop simulation to get desired output hence closed loop simulation completed with variation of load by 10%. Error voltage is given to the PI controller, before given to the PI controller variable output voltage was converted into RMS value and then fed into the PI controller RMS output voltage takes has a reference and it is constant main objective of paper is to maintain the output voltage is 320, hence RMS constant voltage given to the PI controller PI controller process the operation and produce the output voltage this voltage is constant for the pulse width modulation (PWM) in PWM technique we use triangular wave taken has a reference with a frequency of 220Hz, In PWM technique the value of the voltage is equal or greater than the reference signal (=>) it satisfies the operation and then produce the duty cycle these duty cycle considered has a switching pulses to the switch S Controller has a gain of 0.17 and a constant time of 0.5 hence this circuit makes to produce the firing pulses for the switch. The closed loop simulation of the main circuit in MATLAB software is demonstrated in Fig.14.

Fig. 14: Closed loop circuit simulation
III. CONCLUSION

The PV systems are generally used with a boost converter and inverter for getting utilisable power. As the renewable energy resources are important need now-a-days the efficient conversion system is need. In this project SEPIC converter is used as the dual output and the output is given to a multilevel inverter. The output of multilevel inverter is given to a motor for drive applications. It may be helpful in rural areas. The Matlab software is used to analyses the circuit operation and waveforms.

The circuit is simple and easy to understand the entire system have less number of components hence cost will be minimum for the power generation by using the cascaded multilevel inverter and main disadvantage of this system is power loss because of that using the transformers and inductor so proper design of can be done to reduce the losses. This system well for inductive load as well as resistive load and inductive load can be used to drive the motors

REFERENCES


