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A REVIEW PAPER BASED ON MULTI LEVEL INVERTER INTERFACING WITH SOLAR POWER GENERATION

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ABSTRACT

This paper proposes a new solar power generation system, which is composed of a DC/DC power converter and a new multi-level inverter. The DC/DC power converter integrates a DC-DC boost converter and a transformer to convert the output voltage of the solar cell array into two independent voltage sources with multiple relationships. This new seven-degree inverter is configured the use of a capacitor selection circuit and a full-bridge electricity converter, related in cascade. The capacitor selection circuit converts the two output voltage sources of DC-DC power converter into a three-level DC voltage and the full-bridge power converter further converts this three-level DC voltage into a seven-level AC voltage. In this way, the proposed solar power generation system generates a sinusoidal output current that is in phase with the utility voltage and is fed into the utility The salient capabilities of the proposed seven-level inverter are that most effective six power electronic switches are used and handiest one energy digital transfer is switched at high frequency at any time. A prototype is advanced and tested to verify the performance of this proposed sun power era system.

Keywords—Multilevel Inverter, Grid-Connected, Pulse Width Modulated (pwm) Inverter

INTRODUCTION

The extensive use of fossil fuels has resulted in the global problem of greenhouse emissions. Moreover, as the supplies of fossil fuels are depleted in the future, they will become increasingly expensive. Thus sun strength is turning into more vital because it produces less pollution and the value of fossil gasoline strength is rising, even as the value of sun arrays is lowering. In specific, small potential dispensed strength technology systems the use of solar power can be broadly used in residential packages in the close to future. There has been an increasing interest in electrical power generation from renewable energy, and solar energy has been one of the most attractive research areas. Photovoltaic (PV) systems are ideally distributed generation (DG) units, and they offer many advantages such as no fuel costs, no pollution, no noise, and little maintenance. Solar photovoltaic panels have been among the fastest growing energy sources in the world, and the growth is mostly in grid-connected applications.

In 2010, more than 78% of the global market was for grid-connected applications. Most solar cell installations involve the use of multiple solar panels or modules, which might be linked in collection or parallel. The cascaded H-bridge multilevel converter topology requires a separate DC source for every H-bridge, so the combination of the a couple of modules with a multilevel converter makes it one among the proper alternatives for this type of software. Traditional multilevel converters include the cascaded H-bridge converter, diode clamped converter, and flying capacitors converter. This paper presents a single-phase multi-level (H-bridge) cascaded multilevel converter.

EXISTING SYSTEM

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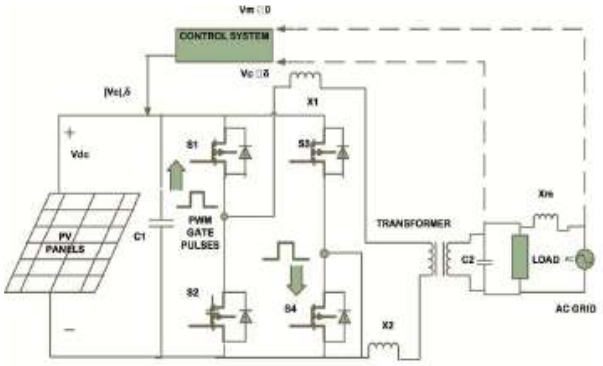

Fig. 1 Existing solar power generation System

The energy conversion performance of the power generation gadget is less. The proposed solar power era system consists of a sun cell array, a DC-DC energy converter and a new Multi-stage inverter. The solar cell array is connected to the DC-DC power converter, and the DC-DC power converter is a boost converter that incorporates a transformer with a turn ratio of 2:1. The DC-DC power converter converts the output power of the solar cell array into two independent voltage sources with multiple relationships, which supply the seven-level inverter. This new seven-level inverter is composed of a capacitor selection circuit and a full-bridge power converter, connected in cascade. The power electronic switches of capacitor selection circuit determine the discharge of the two capacitors while the two capacitors are being discharged individually or in series. Because of a couple of relationships between the voltages of the DC capacitors, the capacitor choice circuit outputs a three-degree DC voltage. The full bridge strength converter similarly converts this 3-level DC voltage to a seven-level AC voltage this is synchronized with the application voltage.

PROPOSED SYSTEM

As seen in Fig. 1, the DC-DC power converter incorporates a boost converter and a current-fed forward converter. The boost converter is composed of an inductor, LD, a power electronic switch, SD1, and a diode, DD3. The boost converter charges capacitor C2 of the seven-level inverter. The current-fed forward converter is composed of an inductor, LD, power electronic switches, SD1 and SD2, a transformer and diodes, DD1 and DD2. The current-fed forward converter charges capacitor C1 of the seven-level inverter.

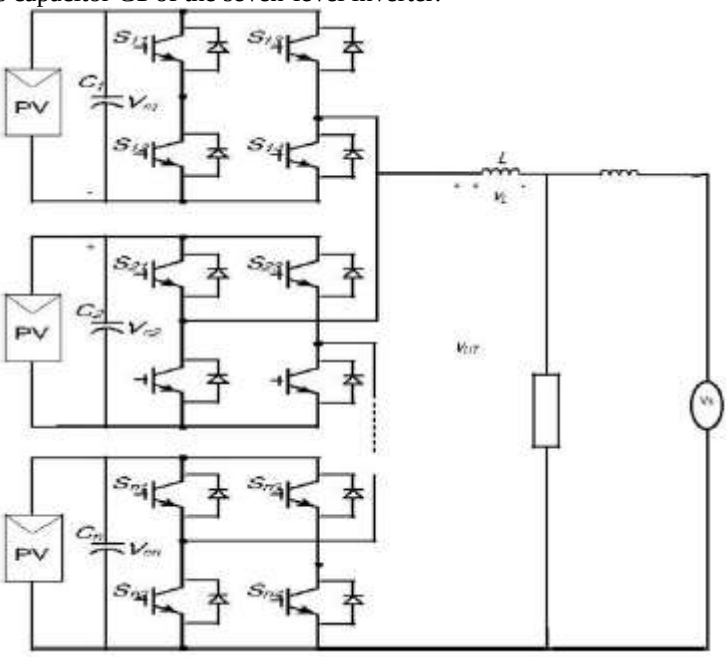

Fig. 2 Proposed multi level inverter using solar power

The inductor, LD, and the power electronic switch, SD1, of the current-fed forward converter are also used in the boost converter. Figure 2 shows the operating circuit of the DC-DC power converter when SD1 is turned on. The solar cell array supplies energy to the inductor LD. When SD1 is turned off and SD2 is turned on, its operating circuit is shown. Accordingly, capacitor C1 is connected to capacitor C2 in parallel through the transformer, so the energy of inductor LD and the solar cell array charge capacitor C2 through DD3 and charge capacitor C1 through the transformer and DD1 during the off-state of SD1. Since capacitors C1 and C2 are charged in parallel by using the transformer, the voltage ratio of capacitors C1 and C2 is the same as the turn ratio (2:1) of the transformer.

MULTI-LEVEL INVERTER

The multi stage inverter is composed of a capacitor choice circuit and a complete-bridge electricity converter, that are connected in cascade. Operation of the seven-level inverter may be divided into the fantastic half cycle and the poor half of cycle of the utility. For ease of analysis, the power electronic switches and diodes are assumed to be ideal, while the voltages of both capacitors C1 and C2 in the capacitor selection circuit are constant and equal to Vdc/3 and 2Vdc/3, respectively. Since the output current of the solar power generation system will be controlled to be sinusoidal and in phase with the utility voltage, the output current of the seven-level inverter is also positive in the positive half cycle of the utility. In grid-connected systems, the panels needed to reach the required power levels are usually arranged in strings. The cascaded multilevel inverter calls for a separate DC source for every bridge accordingly; the high energy and/or excessive voltage from the aggregate of the multiple modules could desire this topology in grid-related PV programs. The multilevel inverter also presents the advantages of reducing the device voltage stress, reducing output filters, and being high efficiency.

RESULTS

Simulation and experimental tests are accomplished to validate the proposed thoughts. In each instances, a multistage cascaded inverter is considered. Each of the bridges has its own 195 W PV panel connected as an independent source. To verify the performance of the proposed solar energy generation gadget, a prototype turned into advanced with a controller primarily based on the DSP chip TMS320F28035. The power rating of the prototype is 500W, and the prototype was used for a single-phase utility with 110V and 60Hz. Table II shows the main parameters of the prototype.

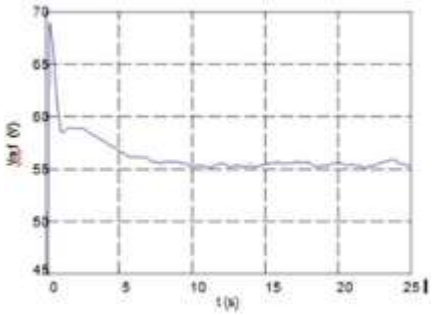

Fig. 3 Reference voltage loop

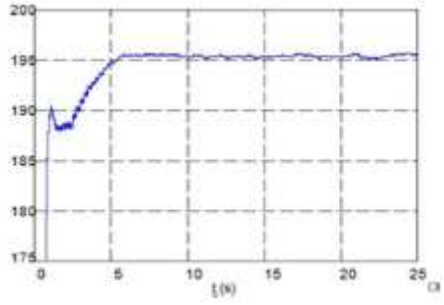

Fig. 4 Output power of the PV panel

The experimental results are supplied inside the experimental consequences additionally show that the grid current has the same phase because the grid voltage and has cohesion electricity thing. In this case, the grid gets electricity from the PV machine. To verify the overall performance of the proposed solar power era gadget, a prototype turned into advanced with a controller based totally at the DSP chip TMS320F28035. The power rating of the prototype is 500W, and the prototype was used for a single-phase utility with 110V and 60Hz.

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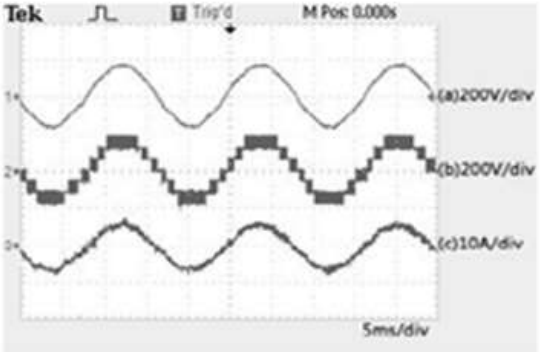


Fig. 5 Experimental result for inverter

To verify the performance of the proposed solar power generation system, a prototype was developed with a controller based on the DSP chip TMS320F28035. The power rating of the prototype is 500W, and the prototype was used for a single-phase utility with 110V and 60Hz.

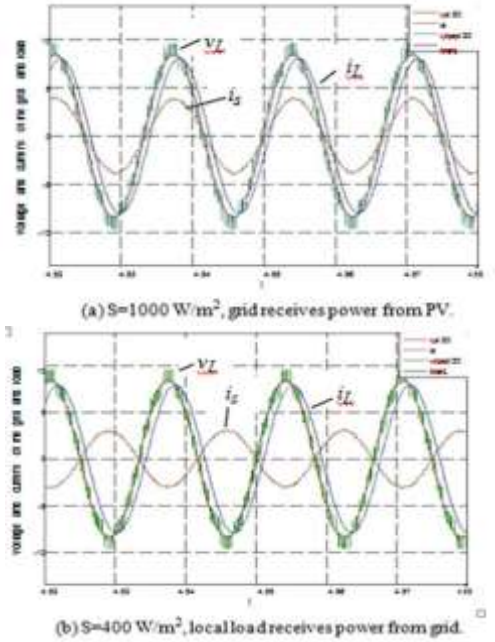
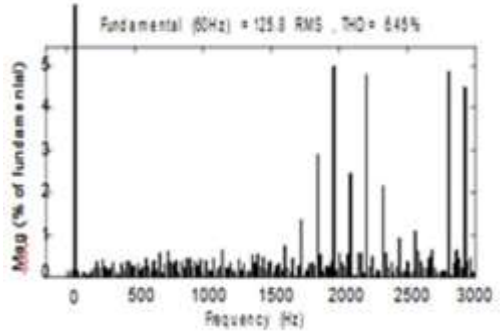


Fig. 6 Voltage and current waveform of grid and load



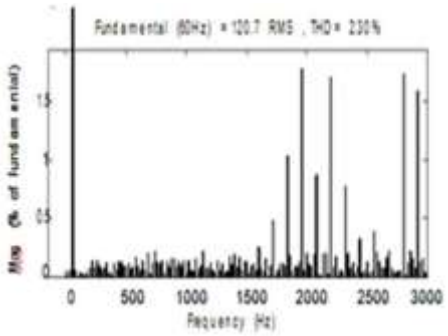


Fig. 7 THD output Voltage

CONCLUSIONS

This paper proposes a sun electricity era device to transform the DC energy generated through a solar mobile array into AC energy that is fed into the application. The proposed sun strength generation device consists of a DC/DC strength converter and a seven-stage inverter. The seven-level inverter contains only six power electronic switches, which simplifies the circuit configuration. Furthermore, only one power electronic switch is switched at high frequency at any time to generate the seven-level output voltage. This reduces the switching electricity loss and improves the energy efficiency. The voltages of the two DC capacitors in the proposed seven-level inverter are balanced robotically, so the control circuit is simplified. Experimental outcomes display that the proposed solar energy era device generates a seven-level output voltage and outputs a sinusoidal modern-day that is in segment with the software voltage, yielding a power factor of unity. In addition, the proposed solar power generation system can effectively trace the maximum power of solar cell array. A hybrid controller is applied to modern-day manage to restrain harmonics and gain 0 error monitoring. Even without output filters, the THD of the weight voltage and grid contemporary are low. The simulation and experimental effects showed the proposed thoughts.

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