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A NOVEL STUDY TOWARDS EFFECTIVE PHOTOVOLTAIC INVERTERS BASED ON H-BRIDGE

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ABSTRACT:

A photovoltaic system includes several interconnected units that are considered to achieve a desired task. In the recent times, most of the photovoltaic inverters are current controlled and injects only active power into utility grid. A photovoltaic inverter is an electrical inverter which changes direct current electricity from photovoltaic array into alternating current for usage with home appliances. Our work has introduced a transformer less topology and specified a different solution for bidirectional switch that is used to produce zero-voltage state. We introduce a novel topology, which is on the basis of H-bridge by means of a novel ac bypass circuit that includes a diode rectifier as well as a switch by means of clamping to dc midpoint is projected. The projected constant common-mode voltage of H-bridge Zero-voltage state rectifier as well as its high efficiency will make it a striking solution for transformer less photovoltaic applications.

Keywords: Photovoltaic system, H-bridge Zero-voltage state rectifier, Transformer less, Active power, Home appliances, Bidirectional switch.

1. INTRODUCTION:

Photovoltaic technology relates to devices that convert sunlight into electricity by means of semiconductors that display photovoltaic effect. The Photovoltaic effect involves voltage creation in a material on exposure to electromagnetic radiation [1]. The inverters of photovoltaic have turn into more and more common in private as well as commercial circles. These inverters change the accessible direct current that is supplied by means of photovoltaic panels and feed it

into utility grid. There are two most important topology groups that are utilized in grid-connected photovoltaic systems, specifically, with and devoid of galvanic isolation. Galvanic isolation may be on dc side as high-frequency dc–dc transformer or else on grid side in form of huge ac transformer. These solutions present safety as well as benefit of galvanic isolation; however effectiveness of complete system is reduced because of power losses in additional components. The significant benefits of transformer less photovoltaic systems are superior effectiveness and decreased size and weight when compared to photovoltaic systems that include galvanic isolation. In our work a novel topology, which is on the basis of H-bridge by means of a novel ac bypass circuit that includes a diode rectifier as well as a switch by means of clamping to dc midpoint is projected [2]. The proposed stable common-mode voltage of H-bridge zero- voltage state rectifier as well as its high efficiency will make it a striking solution for transformer less photovoltaic applications.

2. METHODOLOGY:

The solar cell is basic structure of photovoltaic technology and these cells are basically made of semiconductor materials. The inverter is the important part of photovoltaic system and is spotlight of the entire utility-interconnection codes as well as standards. As the photovoltaic array is a dc source, an inverter is necessary to change dc power to regular ac power that is employed in our homes as well as offices. Bipolar pulse width modulation will produce a stable common-mode voltage, however converter efficiency is low, because of two level output voltage. By means of uni-polar pulse width modulation, output of converter includes three levels, but here produced common-mode voltage contains units of high-frequency, that will leads to extremely high ground leakage currents. Our work has introduced a transformer less topology and specified a different solution for bidirectional switch that is used to produce zero-voltage state. A novel topology was used which is on the basis of H-bridge by means of a novel ac bypass circuit that includes a diode rectifier as well as a switch by means of clamping to dc midpoint is projected. For minimizing of ground leakage current all the way through parasitic capacitance of photovoltaic array, numerous techniques were used. Among them one is to bond midpoint of dc-link capacitors to

neutral grid such as half-bridge or else three-phase full bridge by a split capacitor topology, thus constantly clamping photovoltaic array to neutral connector of utility grid. The topology which is projected will decrease injection of dc current, which is an essential issue in the situation of transformer less topology and is restricted by various standards [3][4]. An additional solution is to separate photovoltaic array from grid, in H-bridge inverters, when zero vector is functional to load. This disconnection is made moreover on dc side of inverter or else on ac side.

3. AN OVERVIEW OF PROPOSED SYSTEM:

Transformer less inverters will provide an improved efficiency, when compared to the inverters that include galvanic isolation. The significant benefits of transformer less photovoltaic systems are superior effectiveness and decreased size and weight when compared to photovoltaic systems that include galvanic isolation. On the other hand, in the situation of omitted transformer, the produced common-mode actions of inverter topology will influence ground leakage current all the way through parasitic capacitance of photovoltaic. In our work a novel topology, which is on the basis of H-bridge by means of a novel ac bypass circuit that includes a diode rectifier as well as a switch by means of clamping to dc midpoint is projected. The proposed stable common-mode voltage of H-bridge Zero-voltage state rectifier as well as its high efficiency will make it a striking solution for transformer less photovoltaic applications [5]. A different solution for generation of zero-voltage state is done by means of a bidirectional switch made of one insulated-gate bipolar transistors as well as one Diode Bridge. The topology in fig1shows bidirectional switches as a supporting component by means of background. This bidirectional switch is clamped to midpoint of dc-link capacitors to fix potential of photovoltaic array moreover during zero-voltage vector when Z1–Z4 and Z2–Z3 are open. Our work has introduced a transformer less topology and specified a different solution for bidirectional switch that is used to produce zero-voltage state. An additional diode is used to defend from short-circuiting of lower capacitor of dc-link. During positive half-wave, Z1 and Z4 are employed to generate the active state, supplying a positive voltage towards load. A stage of zero-voltage is attained by turning

on Z5 when Z1 and Z4 are turned off. The gate signal in support of Z5 is corresponding gate signal of Z1 and Z4, by means of small dead time for avoiding of short-circuiting the capacitor of input. By means of Z5, it is promising for grid current to make a flow in both directions and by this way, inverter moreover feed reactive power towards grid, when needed. During negative half-wave of load voltage, Z2 as well as Z3 produce active vector and Z5 is controlled by means of the complementary signal of Z2 and Z3 and produce the state of zero voltage, by means of short-circuiting inverter outputs and clamping them toward midpoint of dc-link. During dead time, among active state as well as zero state, there is a short phase when freewheeling current locate its path all the way through anti parallel diodes toward input capacitor when the entire switches are turned off. This leads toward high loss when compared to highly efficient and reliable inverter topology, where freewheeling current will discover its path all the way through bidirectional switch, moreover through Z5 or else Z6, based on sign of current. Inverter output voltage includes three levels that considered freewheeling component during dead time. In this situation, load current ripple is extremely small and frequency is equivalent towards switching frequency. The voltage of common-mode is stable for the entire switching states of converter hence leakage current all the way through parasitic capacitance of photovoltaic may be extremely small. In the case of proposed H-bridge zero-voltage state rectifier, it does not matter the sign of load current, always locate a path all the way through bidirectional switch, that is made of diode bridge as well as switch which makes it promising to contain flow of reactive power that supports utility grid by added services any time throughout inverter functioning [6]. The proposed bridge zero-voltage state rectifier, contains considerably lower efficiency, due to controlling nature of bidirectional switch with switching frequency, whereas in highly efficient and reliable inverter topology, bidirectional switch is simply switched by mains frequency.

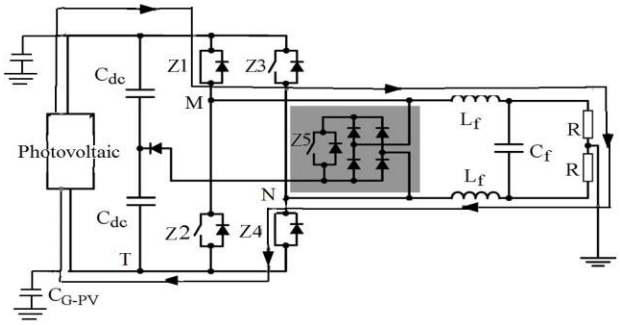

Fig1: An overview of proposed system topology.

4. CONCLUSION:

There is a tough trend in the technology of photovoltaic inverter to make use of transformer less topologies to obtain high efficiencies when combined with extremely lower ground leakage current. For minimizing ground leakage current all the way through parasitic capacitance of photovoltaic array, numerous techniques were used. We introduce a novel topology, which is on basis of H-bridge by means of a novel ac bypass circuit that includes a diode rectifier as well as a switch by means of clamping to dc midpoint is projected. Our work has introduced a transformer less topology and specified a different solution for bidirectional switch that is used to produce zero-voltage state. The projected stable common-mode voltage of H-bridge Zero-voltage state rectifier as well as its high efficiency will make it a striking solution for transformer less photovoltaic applications. In projected rectifier, it does not matter the sign of load current, always locate a path all the way through bidirectional switch, that is made of diode bridge as well as switch which makes it promising to contain flow of reactive power that supports utility grid by added services any time throughout inverter functioning.

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