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HARMONIC REDUCTION USING QUASI Z SOURCE USING PV APPLICATION

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ABSTRACT:

In this paper, a high step-up Quasi-Z Source (QZS) DC-DC converter is proposed. This converter uses a hybrid switched-capacitors switched-inductor method in order to achieve high voltage gains. The proposed converter have resolved the voltage gain limitation of the basic QZS DC-DC converter while keeping its main advantages such as continuous input current and low voltage stress on capacitors. Compared to the basic converter, the duty cycle is not limited, and the voltage stress on the diodes and switch isn't increased. In addition to these features, the proposed converter has a flexible structure, and extra stages could be added to it in order to achieve even higher voltage gains without increasing the voltage stress on devices or limiting the duty cycle. The operation principle of the converter and related relationships and waveforms are presented in the paper. Also, a comprehensive comparison between the proposed and other QZS based DC-DC converters is provided which confirms the superiority of the proposed converter. Simulations are done in PSCAD/EMTDC in order to investigate the MPPT capability of the converter. In addition, the valid performance and practicality of the converter are studied through the results obtained from the laboratory built prototype.

Keywords: *Quasi-Z Source (QZS) DC-DC converter, PSCAD/EMTDC*

INTRODUCTION:

Nowadays, power electronic converters play an important role as renewable energy interface devices. Also, they are widely used in other applications such as distributed generation resources, power factor correction equipment, hybrid electrical vehicles, air-space industries, and HVDC. Power electronic converters are generally classified as DC-DC, AC-DC, DC-AC and AC-AC. In some applications, multi-stage power conversion is required, and simultaneous use of several different types of converters is needed. This increases the number of elements which will result in lower efficiency, higher power loss, higher possibility of failure and lower reliability of the whole system. Impedance network based converters as an emerging technology in energy conversion are invented to overcome these disadvantages. They have capability of single-stage power conversion, and they could overcome the limitations of classical converters. Single-stage power conversion will result in important advantages such as fewer components, lower power loss, higher efficiency, higher reliability and lower cost compared to multi-stage conversion. Various impedance network based converters were proposed in the recent years. A comprehensive review of these structures is given in. Impedance networks proposed in recent years can generally be classified as: 1-Transformer/coupled inductor based (TCIB), and, 2-non-transformer/coupled inductor based (n-TCIB). Comparing these two structures, TCIB structures have two main advantages as higher voltage gain and electrical isolation between input and output. On the other hand, n-TCIB converters have advantages such as lower volume, lower weight, lower cost, lower voltage and current stress on their elements, lower power loss, and higher efficiency.

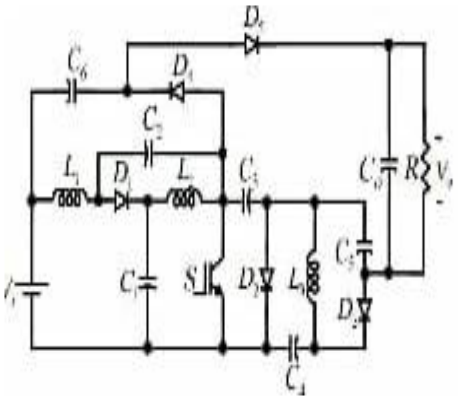
EXISTING SYSTEM:

The power electronic converters play an important role as renewable energy interface devices . Also, they are widely used in other applications such as distributed generation resources, power factor correction equipment, hybrid electrical vehicles, air-space industries, and HVDC. Power electronic converters are generally classified as DC-DC, AC-DC, DC-AC and AC-AC. In some applications, multi-stage power conversion is required, and simultaneous use of several different types of converters is needed. This increases the number of elements which will result in lower efficiency, higher power loss, higher possibility of failure and lower reliability of the whole system. Impedance network based converters as an emerging technology in energy conversion are invented to overcome these disadvantages, They have capability of single-stage power conversion, and they could overcome the limitations of classical converters. Single-stage power conversion will result in important advantages such as fewer components, lower power loss, higher efficiency, higher reliability and lower cost compared to multi-stage conversion. Various impedance network based converters were proposed in the recent years. A comprehensive review of these structures is given.

PROPOSED SYSTEM:

The structure of the proposed high step-up QZS DC-DC converter is shown. In addition to the QZS network, this converter uses C3, C4, C5, and C6 as switched capacitors. The switching of the capacitors is done in offline mode using D2, D3, and D4. The Inductor L3 is also used as the switched As the switch turns off, the 2nd mode of operation begins. In this mode, D1, D3 and D4 are forward biased, while, D2 and D5 are reverse biased. The equivalent circuit of the converter in this mode can be achieved by applying the mentioned on/off states of the switch and diodes. In this mode, Inductors L1 and L2 charge the capacitors C1, C2, and C3 and also charge C6 through the path provided by D4. The capacitor C5 is also charged by L3 and C4. Therefore, the voltages across C1, C2, C3, C5 and C6 increase and they get charged, while, the voltage across C4 and the currents passing through L1, L2, and L3 decrease and they get discharged. Considering the on/off situations of the switching devices, by applying KVL to the main circuit, the following relationships can be written for the second operation mode. As it was mentioned, in mode II, the voltage across C4 decreases while the voltage across C5 increases. As vc4 reaches vc5, the voltage across D2 gets positive, and therefore, D2 gets forward biased and ready to conduct. As D2 conducts, the 3rd operation mode begins. Therefore, in this mode, the switch is still off, D1, D3 and D4 are forward biased, and D2 and D5 are reverse biased. The equivalent circuit of the converter in this mode can be achieved by applying the mentioned on/off states of the switch and diodes. In this mode, L1 and L2 charge C3 and C5 and also C6 through the path provided by D4.Meanwhile, considering the conduction of D2, the capacitors C4 and C5 are connected in parallel and get charged through L3. Therefore, the voltages across C1, C2, C3, C4, C5 and C6 decrease and they get discharged, while, the currents passing through L1, L2 and L3 increase and they get charged.

CIRCUIT DIAGRAM:



CONCLUSION:

An improved QZS based DC-DC converter with high step- up capability was proposed. In addition to the QZS network, the proposed converter has used a combined method of switching-capacitors and switching-inductor. It could resolve the voltage gain limitation of the basic converter while keeping its main advantages such as continuous input current and low voltage stress on capacitors. The maximum duty cycle and voltage stress on the switch and diodes are remained unchanged. Therefore, they will not affect the voltage gain of the converter in practice. Extra stages can also be added to the converter to achieve even higher voltage gains.

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