

# Design and Implementation of PV Power Generation Using Z Source Inverter

K.Jayaraman<sup>1</sup>, D.Vasanthakumar<sup>2</sup>

P.G. Student, Department of EEE, Shreenivasa Engineering College, Dharmapuri, Tamilnadu, India<sup>1</sup>

Assistant Professor, Department of EEE, Shreenivasa Engineering College, Dharmapuri, Tamilnadu, India<sup>2</sup>

**ABSTRACT:** Photovoltaic source has become one of the majority capable DC sources of the future. We use inverter to translate the dc output of the PV in arrange to utilize it for AC appliances. Z-source inverter which is an progress of fixed converter, with a built-in X fashioned impedance network. This provides a single stage power conversion concept whereas the traditional inverter requires two stages power conversion for renewable energy applications. With modification to the traditional pulse width modulated signal there are three PWM strategies are used for Z-source inverter. In this most boost control which helps in high voltage exchange factor with a short shoot through duration and helps in Attaining voltage boost gain by converting all fixed zero states into shoot-through state. This prevents the damage of inverter, high power stress and reduces dead time delay.

**KEYWORDS:** Rectifier, PV source, Boost converter, Z-source inverter, PWM.

## I. INTRODUCTION

Z-source inverter is widely used in low-voltage input applications such as photovoltaic, fuel cells, motor drivers due to its outstanding compared with the traditional voltage source inverter. Worst of all, the boost ability is too small. Several control strategies are provided to overcome these disadvantages of the classic ZSI, but they still have limits to avoid the discontinuous input current, as well as reduce the voltage stress. More importantly, the stronger boost ability is achieved, the larger shoot-through duty ratio should be used, which will result in a poor output voltage profile and low voltage-conversion ratio. Thus, the control strategies are not efficient to improve the boost ability.

Due to the obvious advantages of ZSI, it have been adopted for various applications such as ac motor drives, fuel cell vehicles, Uninterruptible power supplies, residential photovoltaic systems, electronic loads, wind power conversion and distributed generation.

Modern electrical systems like distributed generators, power conditioners, and industrial drives have raised the importance of DC-AC inverters, through which energy is appropriately conditioned. Existing popular inverter topologies still have some constraints to resolve with the first being their inflexible voltage or current conversion ranges. However, the traditional Voltage Source Inverter and Current Source Inverter have been restricted due to their narrow obtainable output voltage range, shoot-through problems caused by misdating and some other theoretical difficulties due to their bridge type structures. Due to the recent advancements in the fields of energy conversion and energy storage, a need has arisen to design inverters which can operate successfully with variable voltage sources such as fuel cells and ultra capacitors.

## II. RELATED WORK

Electricity grids must have standard conditions of supply to ensure that end-use equipment and infrastructure can operate safely and effectively. These conditions are commonly referred to as power quality requirements and are defined in standards or by supply authorities. They most commonly relate to voltage and frequency regulation, power factor correction and harmonics. Other issues related to the connection of DG to a network include voltage rise, unintentional islanding, fault currents, grounding and power output fluctuation, where the latter can have significant impacts on power quality and system safety, security and control. Of the distributed generation technologies, micro-hydro and bioenergy have very constant and predictable energy output and small-scale wind is relatively rare, and so they have little impact on the distribution network. Where small-scale wind is used at higher penetrations, such as on remote mini-grids, well developed technologies such as battery storage and diesel generator backup are currently used. Photovoltaic's on the other hand, are being rapidly deployed at an increasing rate and are often based on a source of energy that can fluctuate daily, hourly and even over shorter periods. Photovoltaic's can also have significant power quality impacts if appropriate measures are not implemented. As a result, solar power is the predominant focus of this report. Nonetheless, the grid impacts discussed in this report capture all those that other DG technologies (such as wind) are likely to have.

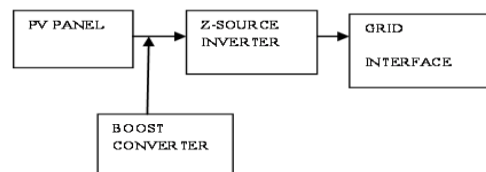
The potential impacts include voltage fluctuations, voltage rise and reverse power flow, power fluctuation, impacts on power factor, frequency regulation and harmonics, unintentional islanding, fault currents and grounding issues.

To overcome the drawbacks of the new ZSI as well as improve the performance of inverter, an extended switched-inductor quasi-Z-source inverter ZSI is proposed in this paper, which combines the new ZSI with classic boost circuit. In addition, an improved SL cell derived from is used in the proposed topology to replace the original one. Although a few components are added, the proposed topology possesses much higher boost ability with the same shoot-through duty ratio than the other topologies to improve the output voltage profile. For the same input and output voltage, the proposed ZSI achieves lower voltage stress on capacitors, diodes and power devices to increase the reliability. Furthermore, the conversion efficiency of the proposed topology is increased. Firstly, the operation principle of the ZSI is analyzed in details.

### III. PROPOSED SYSTEM

Grid-connected PV power system designs focus on converting as much irradiant power as possible into real power (current flowing into the grid in phase with the Utility-defined voltage). The solar inverter is a critical component in a solar energy system. It performs the conversion of the variable DC output of the solar panel. The different families of power converters have been designed to interface the renewable resources for different applications. The traditional power electronic inverters are VSI and Current Source Inverter . In VSI two switches of the same leg can never be gated ON at same time because it causes a short circuit, which would destroy the inverter. The maximum output voltage is obtained by interfacing boost converter system with inverter system which leads to additional task to the controller circuits and this voltage can never exceed the bus voltage. These limitations can be overcome by the proposed maximum boost ZSI system.

#### BLOCK DIAGRAM



#### RESULTS AND DISCUSSION

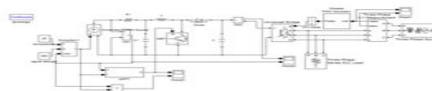


FIG 1: SIMULATION DIAGRAM FOR PV POWER GENERATION USING Z SOURCE INVERTER

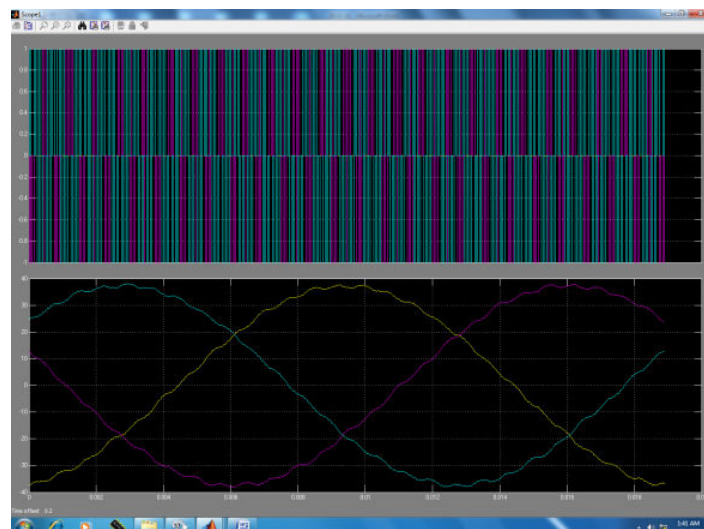
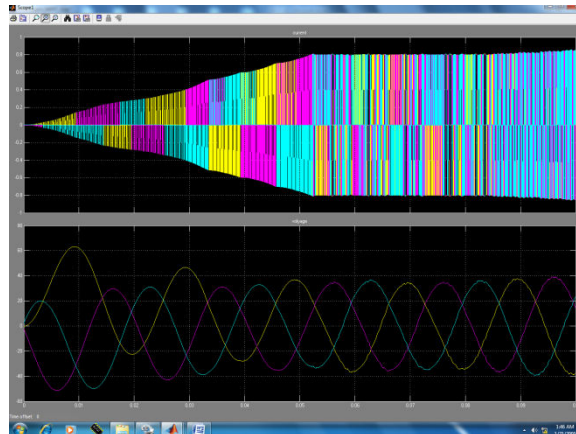


FIG2: Simulation output for voltage &amp; current waveform



#### IV. CONCLUSION

This project is proposed by combining traditional SL-qZSI with boost converter as well as applying an improved SL cell. Compared with the original qZSIs, the proposed qZSI has the following main characteristics: obtains high boost ability with continuous input current; offers lower voltage stress across capacitor, switching devices as well as diodes for the same input and output voltage. Furthermore, the proposed topology will be able to achieve higher conversion efficiency. The Effectiveness of the analysis for the proposed qZSI is verified by simulations and experiments under both simple boost and maximum constant boost control methods. According to above, it can be concluded that the proposed qZSI is more applicable for the distributed generation applications with low voltage sources, such as fuel cells, photovoltaic and so on.

#### REFERENCES

- [1] Yi-Ping Hsieh, Jiann-Fuh Chen, Tsorng-Juu Liang and Lung-Sheng Yang, Novel High Step-Up DC-DC Converter with Coupled-Inductor and Switched-Capacitor Techniques, *IEEE Trans. Ind. Electron.* Vol. 59, No. 2, February 2012.
- [2] Yi-Ping Hsieh, Jiann-Fuh Chen, Tsorng-Juu Liang and Lung-Sheng Yang, Novel High step up DC-DC Converter with Coupled-Inductor and Switched-Capacitor Techniques for a Sustainable Energy System, *IEEE Trans. Power Electron.* Vol. 26, No. 12, December 2011.
- [3] Wuhua Li, Yi Zhao, Yan Deng and Xiangning He, Interleaved Converter with Voltage Multiplier Cell for High step-up and High efficiency Conversion, *IEEE Trans. Power Electron.*, Vol. 25, No. 9, September 2010.
- [4] Shih-Ming Chen, Tsorng-Juu Liang, Lung-Sheng Yang and Jiann-Fuh Chen, A Cascaded High Step-Up DC-DC Converter with Single Switch for Micro source Applications, *IEEE Trans. Power Electron.* Vol.26, No.4, April 2011.
- [5] Shih-Ming Chen, Tsorng-Juu Liang, Lung-Sheng Yang and Jiann-Fuh Chen, A Safety Enhanced, High Step-Up DC-DC Converter for AC Photovoltaic Module Application, *IEEE Trans. Power Electron.* Vol 27, No.4 April 2012.
- [6] S.K. Chanchiang, T.J Liang, J.F. Chen, L.S. Yang, Step-up DC-DC converter by coupled inductor and voltage-lift technique, *IET Power Electron.* 2010 Vol. 3, Iss. 3, pp. 369-378.