A Non-Isolated High-Gain DC to DC Converter Connected Multi-level Inverter for Photo-Voltaic Energy Sources

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The high-gain DC to DC Converter widely used in industrial and power system applications. In particular, the non-isolated converters are highly prepared due to their size and cost. The application such as photo-voltaic (PV) and wind power system, the combination of non-isolated converter and inverter are used. These converters are selected for the specific applications depend on the circuit complexity, reliability and cost. With respect to PV applications, the simple boost wider range voltage gain DC to DC converter is better choice to meet the DC-link voltage of the PV inverters. Comparing with conventional inverters, multi-level inverters (MLIs) are the worthy option, as it has a superiority to suppress the voltage and current harmonics. Even though the reduced switch MLIs are well-established for medium voltage PV system, still the challenges beside to improve voltage harmonic, voltage enhancement, increasing the inverter efficiency etc. Hence, in this paper proposes the PV Power system with single switch non-isolated high-gain DC to DC converter and reduced switch seven-level MLI inverter. The proposed converter is developed with the mixtures of boost and cuk converter; hence it has wider range of control with good efficiency. The experimental study of 400W PV system is established. The experimental results are conformed the theoretical investigation.

Keywords: DC - DC Converter, Multilevel Inverter, PV Powered power converter, Integrated DC – DC Converter

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1. Introduction

The photo-voltaic (PV) power structure, power electronics converters role is unavoidable to converter electrical power DC-DC-AC. There are varieties of converter (DC to DC) and inverter (DC to AC) is recommended by the researchers including with basic boost converter and conventional two-level inverter [1]. Usually, the energy conversion from the photo-voltaic system is implicit to be in a close-fitting area of the maximum power point (MMP) in the PV voltage-current characteristic due to the maximum power point tracking (MPPT). Therefore, this is a significant point to be well-thought-out in the identification of the PV equivalent parameters of a typical model for the voltage- current characteristic. Several of methods of MPPT method are used in several applications. Subjected to the PV converters and its applications, different aspects are considered to enhancing the PV power [2, 3]. In additional more accurate MPPTs techniques and more sensors are essentials. Generally, in PV to measure the voltage sensing is easier than current. The temperature sensors or irradiance sensors are very expensive and unusual.

The MPPTs techniques might be dependent (indirect) or independent (direct) on PV array parameters. In the direct measurement methods uses the voltage and/or current