

A New Switched Capacitor based Five-Level Inverter for PV Applications

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Abstract. The need for electric power is quickly rising; currently, the majority of electric power production is dependent on non-renewable energy sources; of all the sources, solar energy is the most readily accessible and easily employed. The output electricity from solar cell is DC in nature, however for usage, it is required to be transformed in to AC by utilizing an inverters. Multilevel inverters (MLIs) have become a favoured option for medium voltage and high power DC to AC conversion applications to assure high power level cascade type inverter which accepts multiple/single DC sources and offers combined AC output for appropriate voltage and frequency. MLIs provide various benefits over two-level inverters, including lower dv/dt, the capacity to handle greater voltage levels, a quasi-sinusoidal output waveform, and lower Total Harmonic Distortion (THD), among others. The biggest problem in adopting the MLI is the increasing number of switches and it's design. MLIs based on switched capacitors (SC) for boost-type DC-AC converters often demonstrate a trade-off among switch voltage rating and switch count. This article introduces a novel 5-level(5L) SC inverter by adding a switched capacitor module into the usual 3L neutral point clamped inverter leg(NPC). The SC unit consists of one bidirectional switch and two capacitors capable of withstanding one-quarter of the DC voltage. When compared to typical 5L inverters, such as standard NPC and active NPC designs, the novel technique in addition reduces the amount of switches but also shorten the topology. The 5L inverter was examined using several PWM techniques. The simulation results showed that the presented 5L MLI is ideal for a broad variety of applications.

Keywords: Multilevel inverter, Switched capacitor, Harmonic distortion, DC-AC inverter, Solar PV.