ABSTRACT

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This dissertation deals with the development of a solar photovoltaic energy conversion system to feed loads with standard three-phase AC voltage at 60 Hz. The system consists of two DC-DC converters, DC bus voltage regulated at a fixed voltage, and output three-phase inverter based on multilevel topology of type MLC^2. One of the DC-DC converter is of the type Five Level Boost Interleaved and is used for controlling the maximum power point tracking (MPPT), and the other is a simple buck-boost serving to control the flow of energy so that the DC bus voltage is fixed and regulated. The inverter is a multilevel topology MLC^2 with five levels based on switch legs of the type Neutral Point Clamped (NPC) with three levels, but requiring four DC bus capacitors. In the development process of topology Boost Interleaved Five levels, at first, topologies which could fit and form a DC bus with equalized multiple voltages (four capacitors) have been studied. Two MPPT algorithms have been developed in C language: the Perturb and Observe (P & O) method, and the Beta method. Simulations have been performed with the PSIM to evaluate the operation of the energy conversion system with each MPPT method under different switching techniques: PWM, relay (on-off) and interleaved. In the system analysis, emphasis was given to the solar irradiation conditions and the corresponding resultant voltage and current levels in the components, factors that impact the VA ratings for the specification of the circuit devices.

Keywords: Boost Multilevel; Interleaved Boost; NPP; NPC; Constant and regulated DC link voltage; PWM; MPPT; MLC^2.