The world is heading towards an energy crisis and desperate efforts are being made to find an alternative reliable and clean source of energy. Solar Energy is one of the most clean and reliable source of renewable energy on earth. Conventionally, extraction of solar power for electricity generation was limited to PV farms, however, in late 2000, Distributed Generation form of Solar Power has emerged in the form of residential and commercial Grid Tied Micro-Inverters. This dissertation focuses on efficiency optimization of LLC Topology as a Front End DC/DC Stage and Light Load Efficiency Improvement for Output DC/AC stage for Grid Tied Three Phase Micro-Inverters.

This dissertation proposes efficiency optimization by optimal design of resonant parameters of LLC Topology as a Front End DC/DC Converter for PV Applications. It exploits the I-V characteristics of a solar panel to design the resonant parameters such that resonant LLC topology operates near its resonant frequency operating point which is the highest efficiency operating point of LLC Converter.

Due to continuously variable irradiance levels of solar energy, available power for extraction is constantly varying. The PV Inverter operates at its peak load capacity for less than 15% of the day time. In order to justify the high investment cost for solar energy it is of great significance to convert every single watt of power at highest possible efficiency. Every typical power converter suffers through poor light load efficiency performance because of the load independent losses present in a power converter. In order to improve the light load efficiency performance of Three Phase Inverters, this dissertation proposes Phase Skipping Control technique for Three Phase Inverters. This dissertation provides the analysis of this technique on a Half Bridge Three Phase PWM Inverter, however, it can be easily extended to any inverter topology.

Major: Electrical Engineering

Educational Career:
Bachelor's of Electronics Engineering, BS, 2010, University of Pune

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The public is welcome to attend.