Abstract:
The growing concern for energy saving has increased the usage of LED-based street lights, electronic chokes, compact fluorescent lamps, and inverter-fed drives. Hence, the load profile seen by the electrical grid is undergoing a notable change as these devices have to operate from a dc source. Photovoltaics (PV) being a major energy source, the aforementioned loads can be connected directly to the dc bus. A grid-connected PV system involves a power source (PV array), a power sink (load), and two power sources/sink (utility and battery), and hence, a power flow management system is required to balance the power flow among these sources. One such system is developed for selecting the operating mode of the bidirectional converter by sensing the battery voltage. The viability of the scheme has been ascertained by performing experimental studies on a laboratory prototype. The control strategy is digitally implemented on an Altera Cyclone II Field Programmable Gate Array (FPGA) board, and the algorithm is verified for different modes of operation by varying the load. Experimental results are presented to bring out the usefulness of the control strategy.

Index Terms—Bidirectional converter, dc bus, photovoltaic, power flow management system (PMS).