

Abstract

Mohamed Ismail Nassef

Battery-less Hybrid Micro-grid Power Management Using Bi-directional Three Phase Power Converter

This paper proposes the use of a three phase power converter setup with suitable controller, for power flow management over a hybrid micro-grid (including AC and DC grids), without need to any permanent storage systems (batteries fuel cells) on the DC bus to counteract their high cost, complexity of design and integration. Such proposed system is capable of serving low voltage residential and commercial loads, where there would be an availability of renewable energy sources and possible DC loads (heaters, LED lights, electronics, etc ...). Bidirectional power transmission is achieved between AC and DC buses through a three phase bi-directional converter whose primary objective is to maintain a constant DC bus voltage with respect to DC sources loads change. A proportional integral controller is utilized to stabilize the reference DC bus voltage by varying the reference AC grid side current that is controlled by a hysteresis controller. Through MATLAB SIMULINK simulation and practical implementation, the proposed prototype setup was evaluated for different operation scenarios.