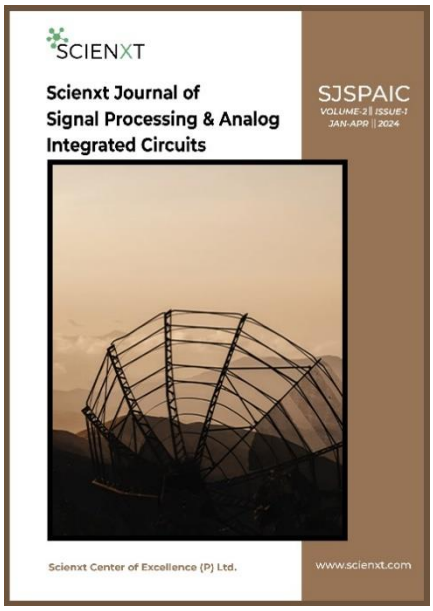

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Result and analysis of microgrid based on wind driven DFIG and boost converter with PV array for optimal fuel consumption

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Abstract:

In this Paper a micro grid is introduced with PVA and battery connected to DFIG for energy sharing. This paper presents a green energy solution to a microgrid for a location dependent on a diesel generator (DG) to meet its electricity requirement. This microgrid is powered by two renewable energy sources namely wind energy using doubly fed induction generator (DFIG) and solar photovoltaic (PV) array. The solar PV array is directly connected to common DC bus of back- back voltage source converters (VSCs), which are connected in the rotor side of DFIG. Moreover, battery energy storage (BES) is connected at same DC bus through a bidirectional buck/boost DC- DC converter to provide path for excess stator power of DFIG. The extraction of maximum power from both wind and solar, is achieved through rotor side VSC control and bidirectional buck/boost DC-DC converter control, respectively. Moreover, the control of load side VSC, is designed to optimize the fuel consumption of DG. A novel generalized concept is used to compute the reference DG power output for optimal fuel consumption. The microgrid is modelled and simulated using Sim Power Systems tool box of MATLAB, for various scenarios such as varying wind speeds, varying insolation, effect of load variation on a bidirectional converter and unbalanced nonlinear load connected at point of common coupling (PCC). The DFIG stator currents and DG currents, are found balanced and sinusoidal. The model is further updated with DC-DC boost converter connected to PVA for maximum power extraction controlled by MPPT algorithm. A comparative analysis is carried out with power delivered from the module to the grid for the two modules.

Keywords:

Wind Turbine, doubly fed induction generator (DFIG), diesel generator, solar photovoltaic array, bidirectional buck/boost DC-DC converter, battery energy storage, power quality.