

Adaptive Power Control Topology Based Photovoltaic-Battery Microgrid System

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Abstract : The ever-increasing integration of renewable energy sources in the power grid necessitates the development of efficient and reliable microgrid systems. Photovoltaic (PV) systems coupled with energy storage technologies, such as batteries, offer promising solutions for sustainable and resilient power generation. This paper proposes an adaptive power control topology for a PV-battery microgrid system, aiming to optimize the utilization of available solar energy and enhance the overall system performance. In order to provide a smooth transition between the OFF-GRID and ON-GRID modes of operation with proportionate power sharing, a self-adaptive control method for a microgrid is proposed. Three different modes of operation are discussed in this paper, i.e., GRID connected, the transition between Grid-connected and Islanded State, and changing the irradiance of PVs and doing the transitioning. The simulation results show total harmonic distortion to be 0.08, 1.43 and 2.17 for distribution generation-1 and 4.22,3.92 and 2.10 for distribution generation-2 in the three modes, respectively which helps to maintain good power quality. The simulation results demonstrate the superiority of the adaptive power control topology in terms of maximizing renewable energy utilization, improving system stability and ensuring a seamless transition between grid-connected and islanded modes.

Keywords : islanded modes, microgrids, photo voltaic, total harmonic distortion

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