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Highly Efficient BBFIC for Grid-Connected Photovoltaic-Battery Energy Storage System Using Hybrid Optimization Assisted Framework

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Abstract

The conventional grid has been combined with a number of renewable energy solutions. As a result, the modern power system is constantly evolving with the help of various power electronics topologies. Due to the growing complexity and new system configuration, the modern power grid is subjected to many challenges and the risk factors are increasing exponentially. In order to evaluate the performance of grid-connected solar photovoltaic (PV) energy systems with battery energy storage system (BESS), highly efficient buck-boost-flyback integrated converter (BBFIC) experiments have been conducted. The whole cybernetics methodology utilized for real-time, closed-loop simulation, validation with other researchers, and numerous optimization techniques are applied in the research work. This paper is developing a new framework that focuses on increasing the voltage gain of the BBFIC for grid-tied PV-BESS. For enhancing the voltage gain of BBFIC, it is planned to optimize the duty cycle of the converter. For optimization purposes, this work deploys a hybrid algorithm termed as “alpha score based on salp-grey wolf optimization (AS-GWO)” that combines the concepts of both “grey wolf optimization (GWO) as well as salp swarm algorithm (SSA).” Finally, it has been demonstrated that the results are superior when compared to other approaches in terms of numerous aspects of measurements.

Keywords: AS-GWO model BBFIC grid-tied systems PV-BESS DC-DC converter

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