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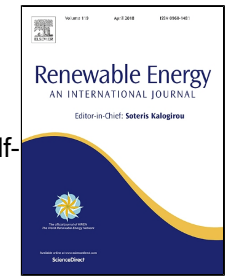

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Optimal Sizing of PV/wind/diesel hybrid microgrid system using multi-objective self-adaptive differential evolution algorithm

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Abstract

Microgrid systems, such as solar photovoltaic power (PV) and wind energy, integrated with diesel generators are promising energy supplies and are economically feasible for current and future use in relation to increased demands for energy and depletion of conventional sources. It is thus important to optimize the size of hybrid microgrid system (HMS) components, including storage, to determine system cost and reliability. In this paper, optimal sizing of a PV/wind/diesel HMS with battery storage is conducted using the Multi-Objective Self-Adaptive Differential Evolution (MOSaDE) algorithm for the city of Yanbu, Saudi Arabia. Using the multi-objective optimization approach, the objectives are treated simultaneously and independently, thereby leading to a reduction in computational time. One of the main criteria to consider when designing and optimizing the HMS is the energy management strategy, which is required to coordinate the different units comprising the HMS. The multi-objective optimization approach is then used to analyze the Loss of Power Supply Probability (LPSP), the Cost of Electricity (COE), and the Renewable Factor (RF) in relation to HMS cost and reliability and is tested using three case studies involving differing house numbers. Results verify its application in

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