

عنوان مقاله:

Techno-Economic Analysis of a Grid-Connected Hybrid Energy System for Developing Regions

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نویسندگان:

M.S Okundamiya - *Department of Electrical and Electronic Engineering, Ambrose Alli University, P. M. B. 14, Ekpoma, Nigeria*

J.O Emagbetere - *Department of Electrical and Electronic Engineering, University of Benin, Benin City, Nigeria*

E.A Ogujor - *Department of Electrical and Electronic Engineering, University of Benin, Benin City, Nigeria*

خلاصه مقاله:

This paper examines the viability of a grid-connected hybrid energy system (HES) for domestic electricity generation in the developing world. It aims to determine the techno-economic benefits of operating a wind energy conversion system. The HES consists of the grid power supply, wind energy conversion, power electronics, and storage units. The grid supply unit incorporates a probability-based prediction technique. The wind energy system modelling is based on the piecewise third order polynomial, using wind turbine power profile supplied by the manufacturer. The formulated optimization problem was solved using a hybrid Genetic Algorithm and Pattern Search (h-GAPS) technique. The h-GAPS based approach constrains the generation and distribution of power to ensure efficient operation. Analysis performed for a typical residential area used meteorological data for six sites, which spread across Nigeria. Results showed that the proposed power system could bring benefits of cost saving and improve power reliability, but the range of financial benefits depends on the geographical coordinates. In particular, 10kW/5.40kWh capacity wind/battery system installed in Sokoto can deal with 95.4% of the total electricity demand, save more than .77% of electricity payments and increase the reliability by approximately 140%

کلمات کلیدی:

Electric power grid, Genetic algorithm, Hybrid energy system, Reliability, Wind power

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