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Experimental Performance of PV-Wind-Battery Hybrid System for Hydrogen Production in Tropical Climatic Condition through Water Electrolysis: A Case Study for Terengganu State, Malaysia

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Abstract

This paper describes the performance of an integrated pv-wind-battery hybrid hydrogen energy production system through water electrolysis particularly in tropical climate situation. The system consists of photovoltaic array (PV), wind turbine (WT), custom-made proton exchange membrane (PEM) electrolyser, battery bank, hydrogen storage tank and an automatic control system for battery charging and discharging conditions. The DC current supplied to PEM electrolyser was obtained from the battery bank which charging by the 1 kW capacity photovoltaic array and wind turbine. The system produced 130-140 ml/min of hydrogen for an average global solar radiation and wind speed ranging between 200 to 800 W/m² and 2.0 to 5.0 m/s, respectively. Furthermore, a mathematical model for each component in the system was established and compared to experimental results.

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