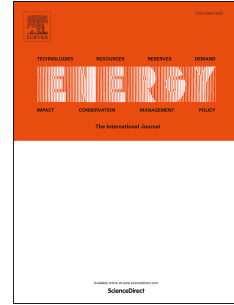


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Techno economic analysis of a wind-photovoltaic-biomass hybrid renewable energy system for rural electrification: A case study of Kallar Kahar

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Abstract

This paper focuses on the techno-economic feasibility of a grid-tied hybrid microgrid system for local inhabitants of Kallar Kahar near Chakwal city of Punjab province in Pakistan and investigates the potential for electricity generation through hybrid wind, photovoltaic and biomass system. The comprehensive resource assessment of wind, biomass and solar energy is carried out for grid integration. Homer Pro software is used to model a hybrid microgrid system. Optimization results and sensitivity analysis is carried out to ensure the robustness and cost-effectiveness of the proposed hybrid microgrid system. The total load has been optimally shared among generated power through wind, photovoltaic and biomass resources and surplus power is supplied to the national grid in case of low local demand of the load. The results of techno- economic feasibility study show that hybrid power system can generate more than 50 MW. The cost of energy based on peak load demand profiles are considered for both residential and commercial sectors. The cost of hybrid system for peak load of 73.6 MW is 180.2 million USD and levelized cost of energy is 0.05744 \$/KWh.

Keywords: Hybrid power system; Wind energy; Photovoltaic System; Feasibility Analysis; Biomass Energy; HOMER Pro, Techno-economic Analysis

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