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DESIGN AND SIMULATION OF HYBRID RENEWABLE ENERGY SOURCES FOR MWANZA INTERNATIONAL AIRPORT

Monyiachi N. Minja[1,2,a] and Aviti T. Mushi[1,b]

[1]Department of Electrical Engineering, University of Dar es Salaam, P.O. Box 35131, Dar es Salaam
[2]TANROADS HQ, P.O. Box 11364, Dar es Salaam

[a]mminja2010@gmail.com
[b]aviti.thadei@udsm.ac.tz, aviti.bahati@gmail.com

Abstract: **This paper presents the design and simulation of hybrid renewable energy sources utilizing both solar energy and wind energy sources with a backup generator. The demand for reliable electric energy in support of investments in large social and economic developmental activities such as airport operations has been an agenda worldwide. In Tanzania, Mwanza International Airport (MIA) consumes about 18 MVA annually of electricity power in support of its operations. About 78–80% of the world commercial energy comes from fossil fuels. Non-renewable fuels apart from other negative effects contribute to the global warming through destruction of ozone layer. Additionally, most of centralized conventional methods of generation require transmission systems, add complexity of the system and poor power quality. Therefore, the proposal to use a mixed coupled hybrid renewable energy source to power the airport is necessary. The considered energy mix are solar photovoltaic, wind, diesel generator and a battery. There is an average solar irradiation of 5.38 kWh/m^2 and wind speed average of 4.20 m/s that is able to be converted to electricity by installation of 10 kW wind turbine. The intermittency is taken care of by the diesel generator and the battery designed at 40 kVA and 400 Ah respectively. The project will be in operational for a period of 25 years hence its costs are reasonable and the justification is the potential of the estimated energy. Some mathematical computations were performed and, in the end simulation results displayed different techno-economic HRES configurations. The complete design of the selected system would include 78.48 kW PV system comprising 314 pieces of 200 W poly-crystalline modules, 608 batteries of 83.4 Ah, 12V rating, load following dispatch strategy, 140 kVA diesel generator, and 41.64kVA bidirectional converter. The net present cost of the selected design was $357,780.8, cost of energy $0.93/kW, and minimum renewable fraction of 40.2%.**

Keywords**:** *Hybrid renewable energy sources (HRES), Solar photovoltaic, Wind system, HOMER*

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