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Feasibility and techno-economic assessment of stand-alone and hybrid RE for rural electrification in selected sites of south eastern Nigeria

[Oluseyi O. Ajayi](#) & [O.D. Ohijeagbon](#)

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Abstract

The study assessed the feasibility and economic viability of solar and wind energy resources as sustainable electrical source for rural communities unconnected to the grid. Rural communities made up of 200 homes, a school and health centre were conceived. Specific electric load profile of 358 kWh per day, with 46 kW primary peak load and 20 kW deferrable peak load, was formulated to match the rural communities. The assessment of the design that will optimally meet the daily load demand with a loss of load probability of 0.01 was carried out by considering three stand-alone applications of photovoltaic (PV), wind, diesel, and a hybrid design of wind-PV. The result showed that a cost-effective alternative for power generation at the different sites surpassed the conventional diesel stand-alone system. Also, the embedded generation analysis showed that 5 of the 6 configurations yielded profits for a 10-year project life in line with the present national tariff order.

Keywords: [photovoltaic power](#), [wind power](#), [solar–wind hybrid](#), [cost per kwh](#), [clean energy](#), [south east Nigeria](#)

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