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Economic modeling of micro-grid energy system with an intermittent power grid in developing countries

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Electricity in most developing countries is inefficient, erratic and unreliable. Recent research work on modeling of a grid-connected power system in developing countries have not considered frequent electricity outage hours per month experienced by consumers. This problem is resolved in an economic modeling of micro-grid energy system integrated into an intermittent power grid. A Hybrid Energy System (HES) offers hopeful solutions to an array of challenges circumventing conventional energy usage. From sustainable mobility developments to rural communities, hybrid energy systems can provide reliable energy to suffice any load demand when properly sized. Sizing optimality is essential in maintaining low-cost, high-performance and superior efficiency. In this presentation, a study on the integration of a micro-grid energy system in an intermittent power grid is demonstrated. The methodology for sizing a photovoltaic-wind-diesel generator and a battery bank with its accompanying costs are shown. The economic analysis of the integrated system is performed using the HOMER software. The results are presented which includes the concept of levelized cost of energy, time-dependent trade-off considerations necessary to deploy a functional, reliable and cost-effective energy system and comfort. The anticipated output of this economic model validates the feasibility of attaining affordability and optimality in an intermittent power grid system that incorporates a HES that relies on renewable energy and battery storage for applications of varying scales.

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