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Title: Feasibility and sustainability analysis of a hybrid microgrid in Bangladesh

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Abstract:

The demand for renewable sources-based micro-grid systems is increasing all over the world to address the United Nation's (UN) sustainable development goal 7 (SDG7) "affordable and clean energy". However, without proper viability analysis, these micro-grid systems might lead to economic losses to both customers and investors. Therefore, this paper aims to explore the feasibility and sustainability of a hybrid micro-grid system based on available renewable resources in remote hill tracts region of Bangladesh. Nine different scenarios are analyzed here, and a combination of solar, hydro, biogas, and diesel generator systems are found to be the best feasible solution in regard to the least cost of electricity and emission. The optimized result shows that with a renewable fraction of 0.995, the unit levelized cost of energy of the micro-grid system is \$0.182 and it emits 54 and 117 times less CO₂ compared to grid-based and diesel-based systems. Further, the fuel share of the system being 0.5% and greenhouse gas per energy being 0.06425 kg/KWh, validate the system as highly sustainable and eco-friendly. With the ability to fulfill load demands without interrupting supply, and reducing the emissions of greenhouse gases, the designed microgrid can provide sustainable energy solutions to any hill-tracts of Bangladesh.