Title:	Design optimization of a grid-tied microgrid for a residential community in southern Bangladesh
Author(s) Name:	Sayeed Hasan, Md. Rifat Hazari, Effat Jahan and Mohammad Abdul Mannan
Contact Email(s):	mdmannan@aiub.edu
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Abstract:
Growing energy demand, diminishing fossil fuel reserves and geopolitical tensions are serious concerns for any country's energy strategy and security. These factors have a greater impact on developing countries, as many of them rely largely on traditional energy resources. Cleaner energy generation is the viable alternative for mitigating these problems, as well as achieving energy independence and tackling climate change. The article discusses planning and design optimization of a residential community microgrid based on multiple renewable resources. In particular, the design and techno-economic assessment of a grid-tied hybrid microgrid for meeting the electricity demand of an alluvial region, Urir Char, located in southern Bangladesh, was addressed. Hybrid Optimization of Multiple Energy Resources is used for the evaluation and it is supplemented by a fuzzy-logic-based load profile design strategy. In addition to the analysis, a predictive load-shifting-based demand management is also introduced. Several cases were considered for the studies and, after considering several criteria, a grid-tied system comprising a photovoltaic array, wind turbine and energy storage system was found to be the best fit for powering the loads. The suggested system reduces the life-cycle cost by 18.3%, the levelized cost of energy by 61.9% and emissions by 77.2% when compared with the grid-only option. Along with the microgrid design, cooking emissions and energy categorization were also discussed.

Keywords:
demand-side management, fuzzy logic,
load profile generator, net-zero energy,
residential microgrid, techno-economic analysis