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Technical and Economic Evaluation of an Autonomous Microgrid's Optimal Scheduling Strategy using the Meerkat Optimization Algorithm

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Abstract: *This research presents a novel approach to Economic-Emission Load Dispatch (EELD) optimization for autonomous microgrids by accounting for the operational and maintenance costs of renewable energy sources (RES). The study employs Meerkat Optimization Algorithm (MOA) to minimize both fuel costs and toxic gas emissions through optimal power scheduling of distributed energy resources. When tested on 3-unit and 10-unit Diesel Engine Generator (DEG) microgrid systems incorporating photovoltaic and wind turbine sources, the MOA-based approach demonstrated superior performance compared to other optimization techniques. For the 3-DEG system, MOA achieved cost reductions of 13.08% and 18.02% compared to African Vulture Optimization Algorithm (AVOA) and Salp Swarm Algorithm (SSA) respectively, while simultaneously reducing emissions by 9.9% and 19.5%. Similar improvements were observed for the 10-DEG system, highlighting MOA's effectiveness in balancing economic and environmental objectives in microgrid scheduling.*

Keywords: Microgrid Scheduling, Meerkat Optimization Algorithm, Renewable Energy Sources

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