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| **Abstract:** |  |
| ***Optimal Power Flow (OPF) presents a formidable challenge in power systems, characterized by non-convex and non-linear optimization constraints. Significant attention has been dedicated to addressing this issue, particularly in optimizing control variables, given their crucial role in achieving system objectives while ensuring stability. Consequently, OPF remains a focal point in power systems engineering. This study utilizes the superiority of feasible solution-moth flame optimization (SF-MFO) algorithm to tackle five key objectives in the OPF problem. These objectives include minimizing power generation costs, reducing power loss, emissions, voltage deviation, and optimizing both cost and emissions simultaneously across various power generation sources, such as thermal and stochastic wind-solar-small hydro. Evaluation of SF-MFO's performance in handling the OPF problem involves utilizing IEEE 57-bus systems integrated with stochastic wind-solar-small hydro power generators. Statistical analyses demonstrate SF-MFO's consistent superiority over alternative metaheuristic algorithms across all simulation scenarios. For instance, in power generation cost and emissions, the IEEE 57-bus systems achieve a rate of 28129.41033 $/hr, representing a 1.02% cost saving per hour compared to the worst results obtained from other algorithms. The study indicates SF-MFO's efficacy in navigating complex search spaces while maintaining feasibility, offering a promising approach to address energy optimization challenges.*** | |