Optimal power flow incorporating stochastic wind and solar generation by metaheuristic optimizers

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ABSTRACT
Optimal power flow (OPF) is one of the complex problems in power system operation that includes multi-modal, large-scale, non-convex and non-linear constrained optimization problems. Due to these features, solving the OPF problem is becoming an active topic to be solved by power engineers and researchers. In this paper, recent metaheuristic algorithms namely Grasshopper Optimization Algorithm (GOA), Black Widow Optimization Algorithm, Grey Wolves Optimizer, Ant Lion Optimizer, Particles Swarm Optimization, Gravitational Search Algorithm, Moth-Flame Optimization and Barnacles Mating Optimizer (BMO) will be used to solve three objective functions of OPF problem viz. (1) cost minimization of the power generation that consists of thermal, stochastic wind and solar power generations, (2) power loss minimization, and (3) combined cost and emission minimization of power generations. To assess the performance of these selected metaheuristic algorithms on OPF, a modified IEEE 30-bus system that incorporate the stochastic wind and solar power generators will be used. Statistical studies are performed to identify the effectiveness of algorithms under consideration. Test results suggest that BMO performs better compared to the rest of algorithms and demonstrate that it can be effective alternative for the OPF problem solution.

KEYWORDS
Acoustic generators; Constrained optimization; Electric load flow; Solar power plants; Stochastic systems

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