Success history moth flow optimization for multi-goal generation dispatching with nonlinear cost functions

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ABSTRACT

Combined Economic Emission Dispatch (CEED) is resolved by combining Success History Moth Flow Optimization (SHMFO) and valve-point loading of thermal generators. This SHMFO the valve-point loading problem is a multi-objective nonlinear optimization problem including generator capacity limits and power balance. The valve-point loading causes oscillations in the input-output characteristics of generating units, hence rendering the CEED problem an imperfect optimization problem. As a benchmark test system for validating the efficacy of SHMFO, IEEE 30-bus systems are studied. Comparing the SHMFO method to other optimization strategies revealed its superiority and proved its capacity to resolve the CEED issue. The OPF is framed as a single or multiobjective problem with restrictions on generator capability, line capacity, bus voltage, and power flow balance to minimize fuel cost, emission, transmission loss, voltage deviation, etc. The numerical findings indicate that the SHMFO algorithm can provide cost-efficiency, diversity, and convergence in a single run. SHMFO performs better than the other algorithms and is an excellent choice for addressing the OPF problem, as shown by the results. On non-dominated solutions, a method adapted from the Technique for Ordering Preferences by Similarity to Ideal Solution (TOPSIS) is used to establish the Best Compromise Solution (BCS).

KEYWORDS

Combined Economic Emission Dispatch (CEED); Grew Wolf Optimization; Success History Moth Flow Optimization (SHMFO); Valve-point loading

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