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A Novel Parallel Hurricane Optimization Algorithm for Secure Emission/Economic Load Dispatch Solution

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HIGHLIGHTS

- A parallel hurricane optimization algorithm (PHOA) is proposed.
- PHOA is to solve economic emission load dispatch (EELD) problem.
- In PHOA, several sub-populations moving independently in the search space.
- Simulations were conducted on standard IEEE 30-bus and IEEE 57-bus test system and comparisons.

Abstract-This paper proposes a parallel hurricane optimization algorithm (PHOA) for solving economic emission load dispatch (EELD) problem in modern power systems. In PHOA, several sub-populations moving independently in the search space with the aim of simultaneously optimize the problem objectives considering the local behavior between sub-populations. By this way, it is intended to search for the Pareto optimal solutions that are in contrast to the single optimal solution. The inherent characteristics of parallelization strategy can enhance the Pareto solutions and increase the convergence to reach the Pareto optimal solutions. Simulations are conducted on three test systems and comparisons with other optimization techniques that reported in the literature are demonstrated. The obtained results demonstrate the superiority of the proposed PHOA compared to other optimization techniques. Additional economic benefits with secure settings are fulfilled, while preserving all system constraints within their permissible limits. Added to that, two security indices are proposed from generation units and transmission lines. The highest security index from generation units reflects that the operating condition achieves more power reserve. In transmission lines, the highest security index means that the transmission lines operated beyond their congestion limits. For justification of the proposed security indices, the proposed solution methodology is employed to assure their benefits

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