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論 文 内 容 の 要 旨

Power distribution network operation is a complex constrained optimization problem. A high quality of continuous service to the customers should be guaranteed while satisfying operational and structural constraints. Introduction of evolutionary algorithms (EAs) to the power distribution network operation has opened many new opportunities. However, many applications of these methods suffer from high computational burden. Performance of EAs is significantly affected by modeling of the problem and employed operators.

Among the distribution network's operational problems, network reconfiguration and service restoration are studied in this work. A branch-based object-oriented modeling is employed in order to represent the network which offers a natural representation of the network and allows for the use of graph concepts for modifying its configuration. Based on this modeling, an integrated EA framework is proposed employing three sets of operators which:

i) reconfigure the network,

ii) minimize amount of the loads that are excluded from recovery,

iii) optimize settings of the network's existing compensators in order to support the restoration process.

In addition, three techniques are proposed in order to introduce more intelligence to the operators and guide the search to more productive areas of the search space by using more information about status of the network.

Furthermore, a new technique is proposed for liming the search space without losing the global search capability of EAs. Simulations show efficiency of the proposed methods in terms of speed and the quality of results.