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电力系统

基于协同进化算法的配电网故障阶段式恢复策略

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摘要
传统的配电网故障恢复算法难于同时兼顾恢复过程的快速性和恢复策略的最优化。文章提出一种将启发式搜索算法与优化算法相结合的配电网故障阶段式恢复策略：第一阶段采用启发式搜索方法恢复负荷供电；第二阶段利用优化算法处理过载的负荷转移；第三阶段按启发式搜索方法处理过载负荷的切除。为实现快速的网络拓扑分析，采用家族树结构表征配电网，并对传统的粒子群优化(particle swarm optimization，PSO)算法与模拟退火(simulated annealing，SA)优化算法进行改进，提出了协同进化算法(co-evolutionary algorithm of PSO and SA，CPSOSA)，CPSOSA算法在求解故障恢复数学模型时具有较高的全局寻优能力。算例分析证明了本文所提恢复策略及算法的可行性和高效性。

关键词 配电网 故障恢复 家族树结构 粒子群优化与模拟退火协同进化算法(CPSOSA)

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A Phased Fault Restoration Algorithm for Distribution System Based on Co-Evolutionary Algorithm of PSO and SA

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Abstract
For traditional distribution network fault restoration algorithm, it is difficult to consider both the quickness of restoration process and optimization of restoration strategy simultaneously. The authors propose a phased distribution network fault restoration method that integrates the heuristic search algorithm with optimization algorithm. In the first stage, the heuristic search algorithm is adopted to restore power supply for loads; in the second stage, the optimization algorithm is adopted to deal with load transfer under overload; in the third stage, the overload is rejected according to the heuristic research algorithm. To implement quick network topology and analysis, the wiring of distribution network is characterized by family tree structure; traditional particle swarm optimization (PSO) algorithm and simulated annealing (SA) algorithm are improved, and a coevolution algorithm of PSO and SA (CPSOSA) is put forward, CPSOSA possesses higher global search ability while fault restoration model is solved. The feasibility and efficiency of the proposed restoration strategy and algorithm are verified by results of calculation example.

Key words distribution systems fault restoration family tree co-evolution algorithm of PSO and SA (CPSOSA)

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