

Wiwat Tippachon 2009: Multi-objective Optimal Placement of Switches and Protective Devices in Electrical Distribution Systems Using Ant Colony Optimization. Doctor of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Dulpichet Rerkpreedapong, Ph.D. 86 pages.

The purpose of this research is to develop an optimal placement methodology of switches and protective devices in electrical distribution systems based on multi-objective optimization. The objective functions are to minimize the System Average Interruption Frequency index (SAIFI), to minimize System Interruption Duration Index (SAIDI) and to minimize the total cost (including customer interruption cost and utility investment cost). The type and location of basic devices in electrical distribution systems (switches, fuses and reclosers) are optimally identified. The multiple ant colony system (MACS) has been improved and applied to solve this problem because it has characteristics of positive feedback, distributed computation, and the use of a constructive greedy heuristic. The standard benchmark instances are used to evaluate performance of MACS compared with the Non-dominated Sorting Genetic Algorithm version II (NSGA-II). The RBTS Bus 2 and 4 and a real 22 kV distribution feeder of Provincial Electricity Authority of Thailand (PEA) are modeled as the test systems. The test results are simulated using Matlab program. The results of placement of switches and protective devices in the electrical distribution systems for both double objective functions and triple objective functions show that the algorithm can successfully determine the sets of optimal non-dominated solutions for all cases. It allows the electric utility to obtain the optimal type and location of devices to achieve the best system reliability with the lowest cost.

Student's signature

Thesis Advisor's signature

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