Pahol Naparat 2007: Optimal Relocation of Sectional Devices for Power System Reliability Enhancement through Monte Carlo Simulation. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Dulpichet Rerkpredapong, Ph.D. 98 pages.

This thesis studies and analyzes the computation of power system reliability indices using Monte-Carlo simulation. Generally, the reliability indices can be simply computed by mathematical formulae, when the exponential distribution, which results in a constant failure rate, is assumed. For the other distributions such as the weibull distribution, the mathematical formulae are not applicable due to inconstant failure rate. As a result, the Monte-Carlo simulation is employed to compute the reliability indices. In addition, this thesis develops an algorithm for relocation of sectional devices in order to enhance the system reliability based on collaboration of genetic algorithm and Monte-Carlo simulation. This will result in optimal locations of fuses and disconnecting switches subjected to budget constraints.

To illustrate performance of the proposed algorithm, a simple power distribution system selected from Roy Billinton's book is first used as a case study. Next, two actual distribution systems of the Provincial Electricity Authority (PEA) of Thailand, feeders SRA05 and SRA06 in Saraburi province, are chosen as more complicated case studies. Monte-Carlo simulation is applied to the above case studies, and the results are compared with those obtained from the mathematical formulae to evaluate the accuracy of the Monte-Carlo technique. Subsequently, it is used together with genetic algorithm to determine the optimal locations of fuses and disconnecting switches of the selected feeders to achieve a better reliability level.

The algorithm presented in this thesis is very helpful for planning engineers in locating fuses and disconnecting switches on their distribution feeders with the purpose of the best reliability. This algorithm is also flexible to any types of statistical distributions, including time-varying failure and repair rates. The results of this research show that the proposed algorithm is practical and appealing for power system planning and reliability enhancement.

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