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Multi-Objective Optimal Planning and Operation of Distribution System Using Genetic Algorithm

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Abstract

This paper proposes optimal planning and operation procedures for radial distribution systems (RDS). The proposed optimal RDS procedures aim to obtain the best selection of cross-section size of distribution branches that leads to the optimal desired performances. The genetic algorithm (GA) is used to obtain the optimal cross-section size of RDS through minimizing the total operating costs and the feeder energy costs, while keeping the voltage regulation within a prescribed value and satisfying the growth factor. After the selection of the optimal branches size, an optimal procedure of RDS is proposed using a distribution system software programming (DSSP). This program is applied to define the optimal radial reconfiguration system with minimum energy loss costs and to satisfy the RDS constraints such as: branch voltage drop, thermal current carrying capacity and balance generation-load demand equation. The DSSP is very useful to find the optimal operation of RDS in the normal and abnormal operating conditions. Different studies are presented to illustrate the capability of the proposed procedures using two real life power distribution systems in Egypt.