Loss Reduction Techniques for Distribution System with Evaluation of Loss and Voltage - A Case Study

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The objective of this paper is to present a methodology to evaluate losses and to minimize the distribution system losses. It proposes the techniques which can be used to minimize the losses in the distribution systems for improving the quality of the voltage under unbalanced conditions. First part of the analysis shows a case study for the evaluation of losses in a substation belonging to a typical electricity distribution system owned by the Ceylon Electricity Board (CEB) electricity utility in Sri Lanka. A methodology is developed to calculate the losses by determining the current with the consideration of the energy consumption data. Line diagram relevant to the substation taken for the case study was developed in Integrated Power System Analysis (IPSA) software package. Load flow analysis of the substation was conducted to determine the losses and the voltage at any location. In the second part, distribution losses were calculated by introducing different techniques i.e. phase balancing, substation relocation and feeder reconfiguration. It was found that the maximum loss reduction as well as substantial voltage improvement can be achieved by feeder reconfiguration. It can be concluded that the above proposed techniques can be used to reduce the distribution system with similar load characteristics.

Key words: Loss Reduction Techniques, Voltage, Integrated Power System Analysis