Reduction of Distribution System Losses in Mazoon Electricity Company

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Abstract
Losses reduction initiatives in electrical distribution systems have been activated due to the increasing cost of supplying electricity, the shortage in fuel with ever-increasing cost to produce more power, and the global warming concerns. These initiatives have been introduced to the electricity utilities in shape of incentives and penalties.

Recently, electricity distribution companies in Oman have been motivated to reduce the distribution technical and non-technical losses at a fixed annual reduction rate for 6 years. In this thesis, different techniques for losses reduction in Mazoon Electricity Company (MZEC) are addressed. In the distribution system of MZEC, high numbers of substations and feeders were found to be non-compliant with the Distribution System Security Standard (DSSS). Therefore, 33 projects have been suggested to bring the non-complying 29 substations and 28 feeders to meet the planned criteria and to comply with the DSSS.

The largest part of MZEC’s 33kV network (South Batinah Governorate) was modeled by ETAP software package, where 14 projects were planned for upgrading existing substations or feeders, 17 projects for constructing new ones, while only 2 projects were aimed to shift loads among substations. The model has been extended to implement the proposed projects and to examine their effects on losses reduction. Simulation results have shown that the implementation of these projects leads to a significant improvement in voltage profile, and reduction in the active and the reactive power losses. The economic analysis has revealed that the implementation of the proposed projects in MZEC leads to an annual saving of about US$ 5 million that represents around 2% of the 2010 turnover of MZEC.

Finally, the company initiatives in reducing the non-technical losses by targeting the metering system have resulted in a significant impact on the final losses percentage per year. Moving in both directions (technical and non technical) will not only enable MZEC to achieve the proposed target but will exceed it in most cases.