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# Generator Maintenance Scheduling Models in Power Systems

Integrated Cost Models for Generator Maintenance Strategy  
under Market Environment

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# Abstract

Change from a regulated to deregulated structure means that, the centralized maintenance system is not valid any more. In the surveyed published literature, there is not a single model which incorporates all maintenance cost components to analyze the effect of different maintenance strategies for generator companies (GENCOs). The work enclosed in this thesis demonstrates that there is a considerable requirement for accurately modelling cost components of the maintenance model, to be used in maintenance scheduling for deregulated power system, in order to attain a superior schedule with major financial and operational impact.

This research investigates and models most cost factors that affect the maintenance activities of the deregulated GENCOs, and demonstrates the utilization of the developed cost models in maintenance scheduling. It also presents the data gathering process for the developed maintenance cost model. A generator maintenance scheduling model that considers direct and indirect maintenance costs, opportunity costs (i.e. loss of customer goodwill), effective maintenance strategies, failures, and interruptions is developed.

A Genetic Algorithm (GA) based approach is employed to achieve maintenance schedules to various generators maintenance scenarios. An Analytical Hierarchy Process (AHP) approach is proposed for modelling customer goodwill. The maintenance model was redeveloped under the Reliability Centred Maintenance (RCM) strategy to analyze the effect of a maintenance strategy on maintenance costs. Case studies are presented to demonstrate the utilisation of the developed models.

The investigation shows that the market prices, opportunity costs and maintenance strategy have an effect on the final maintenance schedule. The research demonstrates that the cost components are critical factors to achieve an effective maintenance schedule, and they must be considered and carefully modelled in order to reflect more realistic situation for maintenance scheduling of generator units in deregulation environment.

Keywords: Deregulate, Power systems, Generator maintenance scheduling, Maintenance costs, Opportunity costs, Customer goodwill, Genetic algorithm (GA), Analytical Hierarchy Process (AHP), Reliability Centred Maintenance (RCM).