UNIVERSITI TEKNOLOGI MARA

THE DOCTORAL RESEARCH ABSTRACTS

Volume: 11, Issue 11 April 2017

ELEVENTH ISSUE

INSTITUTE of GRADUATE STUDIES

IGS Biannual Publication

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Title : COMPUTATIONAL INTELLIGENCE OF PROBABILISTIC SIMULATION IN DEMAND SIDE MANAGEMENT FOR AVOIDED UTILITY COST IMPROVISATION IN A GENERATION OPERATING SYSTEM PLANNING

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In a generation operating system planning, avoided utility cost (AUC) is customarily implemented to attain the optimal economic benefits in a generating system by taking into account intriguing issues on the energy efficiency, renewable energy sources or conservation programs. In this thesis a new approaches of optimal dispatch of limited energy unit (ODLEU) and demand side management (DSM) using computational intelligence approach is proposed for AUC improvement. Contrary to the conventional approaches, which mainly rely on dispatching of each limited energy unit (LEU) in sequential order, the proposed algorithm comprising with optimization technique is used as an alternative for performing LEU dispatch; which has a tangible impact to improve and increase the AUC value. In order produce a global optimal solution of AUC, the self-adaptive strategy was proposed to serve as a new mutation technique responsible to provide a new population for discrete artificial bee colony. The newly designed algorithm is termed as the discrete artificial bee colony associated with selfadaptive strategy (DABC-SAS). The AUC is originated from the summation of avoided energy cost, avoided expected cycle cost and avoided capacity cost of the generating system. All of the main components in the AUC require the information of probabilistic production cost (PPC) and total expected start-up cost (TESC) of generating unit. The PPC is obtained by considering the uncertain load duration curve and forced outage rate of generating unit. On the other hand, the TESC is determined within the framework of equivalent load duration curve, and frequency and duration method. It is arguably that the probabilistic peak shaving technique incorporating with the equivalent load duration curve significantly improves the performance of ODLEU and DSM towards providing accurate result of PPC and TESC followed by the AUC, in contrast with the other techniques of peak shaving and off-loading. On top of that, performance comparison between the basic concept of ODLEU and DSM that used to determine global optimal solution of AUC are numerically demonstrated in a case study of six generating unit's system. Further investigation on the DABC-SAS that improves the performance of ODLEU and DSM has been carried-out by referring to the global optimal solution of AUC associate with energy efficiency concept obtained for the modified IEEE RTS-79 generating system at every load demand variation of 2850MW, 3000MW and 3050MW. Compendium of the results have shown that the DSM based DABC-SAS outperformed the performance of ODLEU based DABC-SAS, basic approach of ODLEU and basic approach of DSM in determining the global optimal solution of AUC.