European Journal of Operational Research. Volume:264. Number: 3. Pages: 1045-1057. February 2018

Profit-maximization generation maintenance scheduling through bi-level programming

P. Mazidi, Y. Tohidi, A. Ramos, M.A. Sanz-Bobi

Abstract— This paper addresses the generation maintenance scheduling (GMS) dilemma in a deregulated power system. At first, under a centralized cost minimization framework, a GMS is formulated and set as the benchmark (cost-minimization GMS). Then, the cost-minimization is changed into a profit-maximization problem of generation companies (GENCOs) and the GMS is developed as a bi-level optimization. Karush-Kuhn-Tucker conditions are applied to transform the bi-level into a single-level mixed-integer linear problem and subsequently, Nash equilibrium is obtained as the final solution for the GMS under a deregulated market (profit-maximization GMS). Moreover, to incorporate reliability and economic regulatory constraints, two rescheduling signals (incentive and penalty) are considered as coordination processes among GENCOs and independent system operators. These signals are based on energy-not-supplied and
operation cost, and ensure that the result of profit-maximization GMS is in the given reliability and social cost limits, respectively. These limits are obtained from the cost-minimization GMS. Lastly, the model is evaluated on a test system. The results demonstrate applicability and challenges in GMS problems.

Index Terms— Maintenance, Scheduling, OR in Energy, Coordination Process, Deregulated Power System

Citation:
Mazidi, P.; Tohidi, Y.; Ramos, A.; Sanz-Bobi, M.A.; "Profit-maximization generation maintenance scheduling through bi-level programming", European Journal of Operational Research, vol.264, no.3, pp.1045-1057. February, 2018.