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Tight and compact MIP formulation of configuration-based combined-cycle units

G. Morales-España, C.M. Correa-Posada, A. Ramos

Abstract— Private investors, flexibility, efficiency and environmental requirements from deregulated markets have led the existence and building of a significant number of combined-cycle gas turbines (CCGTs) in many power systems. These plants represent a complex optimization problem for the short-term planning unit commitment (UC) carried out by independent system operators due to their multiple operating configurations. Accordingly, this paper proposes a mixed-integer linear programming (MIP) formulation of the configuration-based model of CCGTs, which is commonly utilized for bid/offering market processes. This formulation is simultaneously tighter and more compact than analogous MIP-based models; hence, it presents a lower computational burden. The computational efficiency of the proposed formulation is demonstrated by solving network-constrained UC case studies, of different size and complexity, using three of the leading commercial MIP solvers: CPLEX, GUROBI, and XPRESS.

Index Terms— Combined cycle unit, mixed-integer linear programming (MIP), tight MIP formulation, unit commitment.

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