Modeling competition in electric energy markets by equilibrium constraints

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Abstract-

Throughout the world, the electricity industry is currently undergoing significant restructuring toward deregulation and competition. Under this new framework, electric firms assume more risk, and are more responsible for their own decisions. Utilities need original models that fulfil these new requirements. This paper presents a novel conceptual approach to modeling the newly deregulated power markets. It combines powerful traditional tools related to the detailed system operation with techniques for modeling economic market equilibria. The proposed approach models the competitive behavior of the electric firms by incorporating a set of constraints, namely the equilibrium constraints, into a traditional production cost model. These constraints reproduce the first order optimality conditions of the strategic companies. Thus the approach achieves a profit maximization objective while keeping the system operation details. This model has been implemented in GAMS. An application to a sample case study is also presented.

Index Terms- Electricity Market Equilibrium; Unit Commitment; Mathematical Programming with Equilibrium Constraints

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