

Nash equilibrium in strategic bidding: a binary expansion approach

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Abstract-

This paper presents a mixed integer linear programming solution approach for the equilibrium problem with equilibrium constraints (EPEC) problem of finding the Nash equilibrium (NE) in strategic bidding in short-term electricity markets. A binary expansion (BE) scheme is used to transform the nonlinear, nonconvex, NE problem into a mixed integer linear problem (MILP), which can be solved by commercially available computational systems. The BE scheme can be applicable to Cournot, Bertrand, or joint price/quantity bidding models. The approach is illustrated in case studies with configurations derived from the 95-GW Brazilian system, including unit-commitment decisions to the price-maker agents.

Index Terms- Electricity pool market, game theory, market models, mixed-integer linear programming (MILP), Nash equilibrium (NE).I

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