## Bilevel optimization applied to strategic pricing in competitive electricity markets

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Abstract— In this paper, we present a bilevel programming formulation for the problem of strategic bidding under uncertainty in a wholesale energy market (WEM), where the economic remuneration of each generator depends on the ability of its own management to submit price and quantity bids. The leader of the bilevel problem consists of one among a group of competing generators and the follower is the electric system operator. The capability of the agent represented by the leader to affect the market price is considered by the model. We propose two solution approaches for this non-convex problem. The first one is a heuristic procedure whose efficiency is confirmed through comparisons with the optimal solutions for some instances of the problem. These optimal solutions are obtained by the second approach proposed, which consists of a mixed integer reformulation of the bilevel model. The heuristic proposed is also compared to standard solvers for nonlinearly constrained optimization problems. The application of the procedures is illustrated in case studies with configurations derived from the Brazilian power system.

Index Terms— Electricity pool market ; Strategic pricing; Bilevel programming; Mathematical program with equilibrium constraints

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