Price-Maker Wind Power Producer Participating in a Joint Day-Ahead and Real-Time Market - DTU Orbit (15/07/2019)

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The large scale integration of stochastic renewable energy introduces significant challenges for power system operators and disputes the efficiency of the current market design. Recent research embeds the uncertain nature of renewable sources by modelling electricity markets as a two-stage stochastic problem, co-optimizing day-ahead and real-time dispatch. In this framework, we introduce a bilevel model to derive the optimal bid of a strategic wind power producer acting as price-maker both in day-ahead and real-time stages. The proposed model is a Mathematical Program with Equilibrium Constraints (MPEC) that is reformulated as a single-level Mixed-Integer Linear Program (MILP), which can be readily solved. Our analysis shows that adopting strategic behaviour may improve producer’s expected profit as the share of wind power increases. However, this incentive diminishes in power systems where available flexible capacity is high enough to ensure an efficient market operation.

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