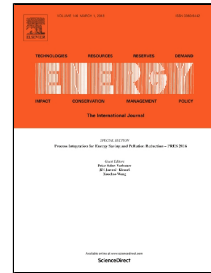


# Accepted Manuscript

Network-constrained optimal bidding strategy of a plug-in electric vehicle aggregator: A stochastic/robust game theoretic approach

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1 **Network-constrained optimal bidding strategy of a plug-in electric**  
2 **vehicle aggregator: A stochastic/robust game theoretic approach**

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7  
8 **Abstract:** This paper presents a strategic bidding model for several price-taker plug-in electric  
9 vehicle aggregators sharing the same distribution network that participate in both day-ahead  
10 energy and ancillary services (up/down-regulation reserve) markets. Since the strategic feasible  
11 space of an aggregator depends on the actions of the other aggregators due to the limited capacity  
12 of the existing feeders, the proposed problem forms a generalized Nash equilibrium problem. The  
13 aggregators' objective is considered to be the cost of purchased energy from the day-ahead and  
14 real-time market minus the revenue from the day-ahead regulation market. A hybrid  
15 stochastic/robust optimization model is employed to deal with different uncertainties an aggregator  
16 faces in the bidding strategy problem. These uncertainties include day-ahead energy prices, day-  
17 ahead up/down-regulation prices, and real-time energy prices. Day-ahead prices are modeled by  
18 different scenarios, while real-time prices are represented by the confidence bounds. Results of a  
19 case study are shown to demonstrate the applicability and tractability of the proposed model.

20  
21 **Keywords:** Aggregator's bidding strategy, game theory, generalized Nash equilibrium, plug-in  
22 electric vehicle, robust optimization, stochastic optimization.

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