Optimal coordinated bidding of a profit maximizing, risk-averse EV aggregator in three-settlement markets under uncertainty - DTU Orbit (12/08/2019)

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This paper develops a two-stage stochastic and dynamically updated multi-period mixed integer linear program (SD-MILP) for optimal coordinated bidding of an electric vehicle (EV) aggregator to maximize its profit from participating in competitive day-ahead, intra-day and real-time markets. The hourly conditional value at risk (T-CVaR) is applied to model the risk of trading in different markets. The objective of two-stage SD-MILP is modeled as a convex combination of the expected profit and the T-CVaR hourly risk measure. When day-ahead, intra-day and real-time market prices and fleet mobility are uncertain, the proposed two-stage SD-MILP model yields optimal EV charging/discharging plans for day-ahead, intra-day and real-time markets at per device level. The degradation costs of EV batteries are precisely modeled. To reflect the continuous clearing nature of the intra-day and real-time markets, rolling planning is applied, which allows re-forecasting and re-dispatching. The proposed two-stage SD-MILP is used to derive a bidding curve of an aggregator managing 1000 EVs. Furthermore, the model statistics and computation time are recorded while simulating the developed algorithm with 5000 EVs.

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