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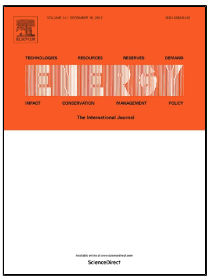

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Vahid Davatgaran, Mohsen Saniei, Seyed Saeidollah Mortazavi

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Optimal bidding strategy for an energy hub in energy market

Vahid Davatgaran*, Mohsen Saniei, Seyed Saeidollah Mortazavi

Department of Electrical Engineering, Faculty of Engineering, Shahid Chamran University of Ahvaz, Ahvaz, Iran

Abstract

An energy hub, as an active element in smart distribution grid, can participate in the day-ahead market via submitting bids to maximize its profit. The multi-input and multi-output energy vectors make energy hub different from other active elements. In this paper, a comprehensive optimal bidding strategy for an energy hub is modeled. The proposed model enables the energy hub to benefit from day-ahead and real-time markets. Stochastic optimization is proposed in this strategy to handle several market uncertainties consisting of day-ahead market prices, real-time market prices, and wind generation. The model takes advantages of multi-inputs vector of energy hub to submit the optimal bids including electricity selling/buying and optimizes the cost. Moreover, it handles the coupling between different types of loads. The problem is modeled as a mixed integer linear program. Numerical simulations evaluate the proposed model.

Keywords: energy hub, bidding strategy, stochastic optimization, prosumer

Nomenclature

t	Time-interval
i,j,m	Indices for input energy, output energy, and energy storage system respectively
s	Indices for scenarios
N_{ess}	number of energy storage systems
N_s	number of scenarios
N_i,N_o	number of input/output energies
δ_m^{ch},δ_m^{dis}	Binary variables; 1 if energy storage system m is charging/discharging
I_{ik}	Binary variable; 1 if convertor ik is on
L	Matrix of output energies
$L_j(t)$	Output energy j at time t
C	Conversion matrix
P	Matrix of input energies
$P_i(t)$	Input energy i at time t
P_i^{min},P_i^{max}	Minimum/maximum capacity of input energy i
P_{ik}^{min},P_{ik}^{max}	Minimum/maximum capacity of input energy to convertor ik

* Corresponding author; email: v.davatgaran@gmail.com, v-davatgaran@phdstu.scu.sc.ir , tel: +989163162930