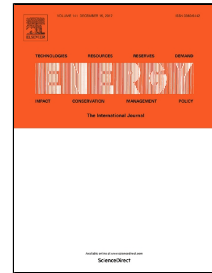


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## Optimal bidding strategy for an energy hub in energy market

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### 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
$\delta_m^{ch}, \delta_m^{dis}$	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 $ik$

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