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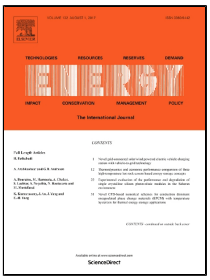

Operational scheduling of electric vehicles parking lot integrated with renewable generation based on bilevel programming approach

Saemeh Aghajani, Mohsen Kalantar

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Operational scheduling of electric vehicles parking lot integrated with renewable generation based on bilevel programming approach

Saemeh Aghajani, Mohsen Kalantar*

Center of Excellence for Power System Automation and Operation, Dept. of Electrical Engineering, Iran University of Science and Technology, P. O. Box:1684613114, Tehran, Iran
E-mail addresses: saemeh.aghajani@gmail.com, kalantar@iust.ac.ir
*Corresponding author. Tel/fax.: +98 21 73225662

With increasing the share of electric vehicles in electricity market, it is important to investigate their impact on electricity trading and their interactions with other market entities involved in the system. This paper provides a methodology to develop the interaction between parking lot and distribution system operator in energy and reserve market while considering load and wind power uncertainty. To this end, a bilevel approach is applied to model inherently conflicting objective between distribution system operator and parking lot and interactions between the two agents. In the proposed model, upper-level problem represents the total operation cost minimization from the distribution system operator's perspective while the lower-level problem represents the scheduling energy and reserve from the parking lot owner's point of view with the objective of minimizing the parking cost. The method is capable of finding the equilibrium point for decision making conflict between the objective of the upper and lower level. The proposed bilevel problem is reduced to a single level optimization problem by implementing dual theorem and the Karush–Kuhn–Tucker optimality conditions. The numerical results illustrate the effectiveness of the proposed method.

Keywords: Distribution system, Mathematical program with equilibrium constraints (MPEC), Parking lot (PL), Reserve market, Uncertainty.