Motahareh Mojarad, Mostafa Sedighizadeh, Mohamad Dosaranian-Moghadam, 2021, A two-stage stochastic model based on information gap decision theory method for optimal allocation of intelligent parking lots in distribution systems considering severe uncertainties, *Intl. Trans. Electrical Energy Systems,* First published: 18 August 2021.

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Abstract Electrification of transportation is one of the new ways to deal with environmental issues. In order to reach sustainable development, efficient integration of the plug-in electric vehicles (PEVs) into the distribution network (DN) plays a significant role. Establishment of PEV intelligent parking lots (IPLs) is one of the important solutions to develop charging stations. However, one of the problems with IPLs is restrictions created by municipalities and DNs while the common parking lots are not faced with these constraints. The aim of this paper is the optimal allocation of IPLs through a two-stage mathematical model in order to minimize system costs. The system cost involves installation cost, cost of exchanging electrical power with the upstream grid, cost of the electrical power loss, network reliability cost, and emissions cost. In the first stage, the behavior of IPLs is optimized taking into account the market interactions for enhancing the IPL owner's profit. In the second stage, optimal allocation of the IPL is performed considering various network constraints. Demand response is considered as Time of Use program. Information gap decision theory is developed to hedge the DN operator and IPL owner against the risk imposed by the information gap between the forecasted and actual uncertain variables. The effectiveness and efficiency of the proposed model are evaluated on the IEEE 33-bus test network. In the end, the presented model with simultaneously optimization can lessen the total cost by 7.74%, 15.48%, and 19.27% compared to cases, which only optimize active power loss, reliability, and emissions, respectively.