Khalil Gholami, Ali Azizivahed, Ali Arefi, 2022, Risk-oriented energy management strategy for electric vehicle fleets in hybrid AC-DC microgrids, *Journal of Energy Storage*, Volume 50, June 2022, 104258.

Highlights

- This research concentrates on presenting an effective tool for managing electric vehicle fleet in hybrid AC-DC microgrids under the high penetration of renewable energy sources (RESs).
- The scheduling of electric vehicle fleet is modeled from the viewpoint of distribution system operators to minimize the operational cost.
- The uncertainty of load and RESs are modeled by an efficient mechanism, named information-gap decision theory (IGDT) from the perspective of risk-averse and risk-seeker operators.
- The proposed approach is formulated as mixed integer linear programing (MILP) and implemented on 69-bus and 94-bus systems, operated as hybrid AC-DC microgrids.

Abstract Electric Vehicle Fleets (EVFs) will play a significant role in the near future transportation systems due to their environmental friendliness. However, they bring technical and economic challenges for distribution system operators (DSO), such as voltage problems and high operational costs over the peak period. To this end, this investigation exploits a new management strategy to schedule the charging/discharging of EVFs in hybrid AC-DC microgrids under the high penetration of renewable energy sources (RESs). The proposed scheduling problem is formulated for operational cost minimization, subject to various technical constraints regarding microgrids, EVFs, etc. To handle the uncertainty of load demand, RERs, and energy consumption of EVFs affected by external factors, information-gap decision theory (IGDT) is taken into account from the standpoint of both risk-averse and risk-seeker operators. The problem is then solved via the powerful solver named CPLEX due to the linear configuration of the suggested approach. The efficiency and applicability of the proposed management strategy are examined by implementing it on modified 69-bus and 94-bus systems, which are operated as hybrid AC-DC microgrids. The results show that DSO can mitigate the operational cost and enhance the technical aspects, whether EVFs collaborate in management scheme in the presence of generation resources. The results of uncertainty modeling via IGDT demonstrate that DSO can effectively schedule EVFs under the possibility of parameters with a particular uncertainty budget. This means that risk-averse operators can predict how much extra expenditure is imposed if parameters under uncertainty violate their forecasted amount. This is vice versa for risk-seeker operators because of taking advantage of the division of uncertain parameters.

Keywords Hybrid AC-DC microgrids, Renewable energy sources (RESs), Electric vehicle fleet, Energy management, Information gap decision theory (IGDT), Uncertainty.