Kasi Vemalaiah, Dheeraj Kumar Khatod and Narayana Prasad Padhy, 2023, Optimal day-ahead scheduling of distributed energy resources: A strategy based on information gap decision theory to address multiple uncertainties in the active distribution networks, IEEE International Conference on Energy Technologies for Future Grids, Wollongong, Australia, December 3–6, 2023.

Abstract The optimal scheduling of distributed energy resources within the distribution network improves the system's performance. Nevertheless, the inherent uncertainty associated with distributed energy resource output (especially renewable energy-based) and load demand poses a challenge when making optimal decisions. This paper proposes an information gap decision theory-based day-ahead scheduling scheme to maximize the robustness against multiple uncertainties having a lack of information. The uncertainties considered in this paper are photovoltaic generation and load demand. This framework quantifies how well a scheduling strategy performs in the presence of uncertainties by quantifying with a robustness function. Due to these multiple uncertainties, the proposed framework is formulated as a multi-objective optimization problem in the form of a mixed integer second-order cone program, which ensures a global solution. This scheme is implemented in GAMS software and solved using the GUROBI solver. To verify the effectiveness of the proposed framework, it is tested on a modified IEEE 33-bus distribution system. The results show that the proposed scheme is robust against multiple uncertainties and easy to implement with less computational time.

Keywords Day-ahead scheduling, distributed energy sources, information gap decision theory, multiple uncertainties, robust scheduling.