Reza Aboli, Maryam Ramezani and Hamid Falaghi, 2019, A hybrid robust distributed model for short-term operation of multi-microgrid distribution networks, *Electric Power Systems Research,* Volume 177, December 2019, 106011.

Highlights

- Information gap decision theory to modeling of renewable generations uncertainties.
- Fully robust distributed optimization of multi-microgrid distribution network.
- Modeling of price and renewable generation uncertainties using hybrid robust method.

Abstract In a multi-microgrid active distribution network (MADN), every microgrid (MG) or distribution company (DISCO) is operated as a distinct entity with a different risk level in dealing with uncertainties. Hence, a centralized management for these types of networks is not possible. Moreover, in a centralized formulation, it is very difficult to model different risk levels of uncertainties appropriate to each entity. This paper presents a hybrid robust optimization framework for distributed operation of a MADN. In the first stage, the risk-averse information gap decision theory (IGDT) approach is applied to the model of renewable generation and load uncertainties. To maintain the convex structure of the problem, a robust optimization approach with the worst case realization of uncertainty is used to model day-ahead market price uncertainty. Then, based on a heuristic approach and augmented Lagrangian relaxation (ALR) methods, the centralized problem is decomposed into a DISCO problem and several MG problems with a desired risk level. The proposed method is applied to a modified IEEE 33-bus system, and the numerical results are presented for different case studies. The efficiency of the proposed model is shown by comparing the results with those of centralized and traditional distributed robust optimization models.

Keywords Multi-microgrid, Robust optimization, Info-gap decision theory (IGDT), Distributed optimization.