Abstract Increasing the world-wide efforts towards low-carbon economy, highlights the role of renewable energy resources(RESs) in power systems. The volatility of RESs, however, is a major challenge for system operators, and there is need to deal with their uncertainty. Regarding this, microgrids (MGs), as the clusters of different RESs and other distributed energy resources, should take the responsibility of dealing with uncertainty. To do so, a risk-averse energy management strategy (RA-EMS) is introduced for distribution systems under the penetration of renewable energy-based MGs. The status of the connecting switches between clusters and their interaction with the distribution system is examined in several cases. In addition to wind turbine and photovoltaic as RESs, the MGs are equipped with electric vehicles, as another environmentally friendly forms of technology, demand response program, and micro turbines. The uncertainty of renewable generation is modelled via information gap decision theory (IGDT) technique. To validate the effectiveness of the proposed model, it is tested on 94 bus actual Portuguese distribution test system. The results show the importance of MG clustering in improving the techno-economic characteristics of the distribution system. Also, it is evident from the results that uncertainty of RESs is a crucial factor in MG clustering.

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