

Sahar Seyedeh-Barhagh, Mehdi Abapour, Behnam Mohammadi-Ivatloo, Miadreza Shafie-Khah, and Hannu Laaksonen, 2024, Optimal scheduling of a microgrid based on renewable resources and demand response program using stochastic and IGDT-based approach, *Journal of Energy Storage*, 86 (2024) 111306.

Abstract Optimal economic scheduling of microgrids with photovoltaic (PV) and wind generation has gained increased attention during recent years. Integration of renewable energy resources in microgrids requires increasingly active control and management of energy storages and demand response (DR). In this paper, a risk-based stochastic optimal energy management model is developed for microgrid with renewables, energy storage and load control by time-of-use-based DR programs. Microgrid includes PV system, wind system, micro-turbine, fuel cell, electric vehicle (EV), and energy storage. Information-gap decision theory (IGDT) is employed to address the uncertainty of loads and to provide the operating strategies for the microgrid controllable energy resources. This proposed model has been solved as a mixed-integer non-linear programming (MINLP) in General Algebraic Modeling System (GAMS) software and simulation results in different conditions are studied and discussed. Three different risk management strategies have been studied such as risk-averse, risk-neutral and risk-seeker mode. The simulation results indicate that the impacts of risk-averseness or risk-seeker of the decision maker affect the system operation. For instance, the results showed the DR program's role in risk-averse and risk-taking strategies, impacting consumption and costs. The proposed model ensures the risk-averse decision-maker that if the uncertain parameter deviates within the optimum robustness region, the final cost will not exceed the critical cost. On the other hand, the risk-seeking decision-maker can reach lower final costs by accepting the risks if the uncertain parameter deviates favorably within the opportunity region. Decision-makers can manage risks by adjusting consumption. Thus, considering the cost of risk management is crucial, as it increases with robust or opportunistic approaches.

Keywords Optimal operation, Renewable generation, Microgrid, Demand response, Uncertainty management, Photovoltaic system, Electric vehicle.