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Abstract The optimal management of distributed energy resources (DERs) and renewable-based generation in multi-energy systems (MESs) is crucial as it is expected that these entities will be the backbone of future energy systems. To optimally manage these numerous and diverse entities, an aggregator is required. This paper proposes the self-scheduling of a DER aggregator through a hybrid Info-gap Decision Theory (IGDT)-stochastic approach in an MES. In this approach, there are several renewable energy resources such as wind and photovoltaic (PV) units as well as multiple DERs, including combined heat and power (CHP) units, and auxiliary boilers (ABs). The approach also considers an EV parking lot and thermal energy storage systems (TESs). Moreover, two demand response (DR) programs from both price-based and incentive-based categories are employed in the microgrid to provide flexibility for the participants. The uncertainty in the generation is addressed through stochastic programming. At the same time, the uncertainty posed by the energy market prices is managed through the application of the IGDT method. A major goal of this model is to choose the risk measure based on the nature and characteristics of the uncertain parameters in the MES. Additionally, the behavior of the risk-averse and risk-seeking decision-makers is also studied. In the first stage, the sole-stochastic results are presented and then, the hybrid stochastic-IGDT results for both risk-averse and risk-seeker decision-makers are discussed. The proposed problem is simulated on the modified IEEE 15-bus system to demonstrate the effectiveness and usefulness of the technique.

Keywords Demand response, Distributed energy resources, Microgrid, Multi-energy system, Stochastic programming.

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