Abstract

In order to further analyze the flexible coupling and complementary characteristics of various energy resources in the integrated energy system (IES) and increase the absorption capacity of renewables, concentrating solar power (CSP) plants and generalized energy storage (GES), such as electric energy storage systems, heat storage systems, and natural gas storage systems, are introduced into the IES. First, the framework of the electricity-heat-gas integrated energy system (EHGIES) structure is built, and the main equipment models are constructed. Second, the deterministic dispatch model for the EHGIES is established by minimizing the operating cost of the system. Third, info-gap decision theory is leveraged to effectively handle the uncertainties of photovoltaic, wind generation, electric, thermal, and gas loads. Based on two different risk preferences of risk aversion and risk seeking (opportunity seeking), multi-objective dispatch models under opportuneness and robustness strategies are established, and these multi-objective models are further transformed into single-objective models through the analytic hierarchy process. Finally, the feasibility, effectiveness, and superiority of the proposed models are verified by case studies.