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Abstract In recent years, significant efforts have been made worldwide, including research projects and political resolutions, to support the incorporation of renewable energy sources into power systems to help sustainable energy goals. Moreover, to build cleaner and sustainable energy systems, it is necessary to develop integrated systems, known as multi-energy systems (MES), where multiple electricity production facilities optimally communicate with each other in different layers, creating an energy hub. This work seeks to develop an energy hub model to help energy system operators make better decisions in scenarios of high uncertainty. In this model, the information-gap decision theory (IGDT) is applied to measure risk. The considered uncertainties in this study include the price of natural gas and electricity. A 'time-of-use' code is also considered the change of a percentage of the load from peak hours to valley hours, minimizing the operating costs. The results demonstrate that risk management tools, such as an IGDT-risk-averse model and the introduction of demand response programs, are fundamental tools for assessing the impact of uncertainty on energy hubs. Indeed, the tool allows the operator to maintain an acceptable level of uncertainty and robustness of the system while ensuring that the system is reliable and has acceptable operating costs.

Keywords demand response; energy-hub; Info-gap Theory; multi-energy system; risk management; uncertainty