

Divya Sharma and Naran M. Pindoriya, 2023, An overview of optimization techniques for operation and planning of energy hub under uncertainty, November 2023. Conference: 2023 IEEE PES Innovative Smart Grid Technologies – Asia (ISGT Asia). DOI: 10.1109/ISGTAsia54891.2023.10372680

Abstract Environmental concerns, fossil fuel shortages, and rising energy demand have prompted energy system upgrades and restructuring. Therefore, it can be asserted that in the near future, a sustainable multi-energy system (MES) is anticipated to play a prominent role in energy production. The concept of an energy hub (EH) shows promise in facilitating optimal management of system that involve multi-energy carriers. An EH is a complex system designed to convert and store various forms of energy. This approach has significant potential for advancing the development of sustainable MES. The task of managing an EH involves addressing various forms of uncertainty, including but not limited to renewable energy generation, energy consumption patterns, and energy pricing. The presence of uncertainties necessitates the use of advanced decision-making techniques, among which optimisation stands out as the primary category of decision-making approaches. This paper reviews the optimization approaches, such as stochastic programming (SP), chance-constrained (CC), information gap decision theory (IGDT), and robust optimization (RO) for operation and planning decisions in an EH, considering generation and demand side flexibility. Furthermore, the article outlines potential avenues for future research in the optimisation field and provides different strategies for dealing with EH's inherent difficulties.

Keywords Energy Hub, Information Gap Decision Theory, Multi-energy System, Operation and Planning, Flexibility, Uncertainty, Robust Optimization, and Stochastic Programming.