Mostafa Kafaei, Davoud Sedighizadeh, Mostafa Sedighizadeh, Alireza Sheikhi Fini, 2022, An IGDT/Scenario based stochastic model for an energy hub considering hydrogen energy and electric vehicles: A case study of Qeshm Island, Iran, *International Journal of Electrical Power & Energy Systems*, Volume 135, February 2022, 107477.

Highlights

- Proposing an EH based on CCHP-ORC equipped by SWD, hydrogen electrolyser and EVs.
- Assessing the effects of installation of WST on optimal operation of EH and other storage devices.
- Modeling EVs uncertainties using scenario generation.
- Presenting a Robust stochastic optimization using IGDT.
- Considering two objective functions simultaneously as operational costs and emission.

Abstract With the development of human societies, new industries and needs are being formed which supplying their power and energy consumption, requires the development of equipment and infrastructure in the field of power generation and transmission. An example of these industries are seawater desalination (SWD) units. In addition, increasing attention to air pollution has led to the proliferation of electric vehicles (EVs) or the use of hydrogen as a zero emission fuel. Energy hubs (EHs) can benefit from advantages such as optimal use of installation capacity and environmental potential by accepting to provide other needs along with common requirements such as electricity, cooling, and heating. In this case, EH is able to increase its flexibility by converting energy into the desired product and storing it in a different form as of electrical or thermal energy. In this paper, EH utilizes a SWD with Reverse Osmosis (RO) technology as a flexible load and an Organic Rankine Cycle (ORC) as a new technology for generating electrical power by means of thermal power. In addition, for better interact with available EVs, one parking lot and a Battery Swapping Station (BSS) are introduced. The Electrolyser uses the electrical power to supply the required amount of hydrogen, and the hydrogen tank in addition to fuel cell (FC) help to balance the production and consumption of hydrogen. In order to model the existing uncertainties, scenario generation method as well as information gap decision theory (IGDT) method have been used. The efficacy of the proposed model is evaluated on a smart commercial building in Qeshm Island, which is located a few kilometers off the southern coast of Iran.

Keywords Electric vehicle (EV), Energy hub (EH), Flexible load, Hydrogen energy, Information gap decision theory (IGDT), Seawater desalination (SWD)

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