

Ali Mohammad Rostami, Hossein Ameli, Mohammad Taghi Ameli and G. Strbac, 2020, Information-gap decision theory for robust operation of integrated electricity and natural gas transmission networks, International Conference on Smart Energy Systems and Technologies (SEST), September 2020. DOI: 10.1109/SEST48500.2020.9203435.

Abstract Natural gas consumption and the share of renewable energy in meeting global energy demand has grown dramatically in the recent years. On the other hand, the rapid growth of gas-fired generating units (GFU) (i.e., producing lower carbon dioxide emissions compared to coal-fired generating units), could play a key role in more integration of renewable energy sources (RESs) into the system due to their high flexibility. Therefore, the interaction between the electricity and natural gas networks (ENGN) becomes more challenging. This paper proposes a robust multi objective integrated mixed integer nonlinear optimization model, utilizing information-gap decision theory (IGDT), for secure and optimal operation of ENGN considering security constraints as well as gas and electricity load demand uncertainties. This bi-objective optimization problem is modified using normalization in the weighted sum method in order to ensuring the consistency of the optimal solutions. The proposed framework is validated on the modified IEEE 24-bus power system with a 15-node natural gas system.

Keywords Natural gas, Uncertainty, Load modeling, Compressors, Mathematical model, Pipelines, Power generation.