

Mohammad Salimi, Mohamad-Amin Nasr, Seyed Hossein Hosseinian, Gevork B. Gharehpetian, and Mohammad Shahidehpour, 2020, Information gap decision theory-based active distribution system planning for resilience enhancement, *IEEE Transactions on Smart Grid*, to appear.

Abstract Severe disruptions caused by natural disasters have highlighted the significance of enhancing the distribution system resilience in recent years. However, due to severe uncertain characteristics of natural disasters, there exists an insufficient level of information to evaluate their behavior and consequences. Lack of information such as proper distribution functions for probabilistic methods or known intervals for robust optimization techniques may provide Distribution System Planners (DSPs) with inaccurate designs. This paper presents a new strategy based on Information Gap Decision Theory (IGDT) to facilitate decision making for DSPs in the face of extreme events. Moreover, a detailed analysis is performed to find a trade-off between the DG allocation and the hardening schemes, and to determine the best conservativeness degree in the IGDT approach. The presented resilience model is implemented on 33-bus and 94-bus distribution systems, and numerical case studies are analyzed to demonstrate the merits of the proposed approach. The results indicate that with a limited planning budget, the proposed trade-off analysis can optimally find the best DG allocation and hardening schemes to keep the load shedding level below a desired threshold following a severely uncertain extreme event.

Keywords Resilience, extreme events, distribution system planning, risk-averse strategy.