

Elaheh Karkian, Alireza Askarzadeh and Mohammad Ali Alipour, 2024, Uncertainty-based optimal planning of service transformers in distribution network considering load profile: Risk-averse and risk-taker strategies modelled by information gap decision theory, *Electrical Engineering*, <https://doi.org/10.1007/s00202-024-02843-5>

Abstract In power system, load demand uncertainty can significantly affect the planning results. The main aim of the present paper is to investigate risk-averse (RA) and risk-taker (RT) strategies for optimal allocation of service transformers in distribution network considering load profile in the presence of load demand uncertainty. For this goal, load demand uncertainty is modelled by information gap decision theory (IGDT) and its impact on the planning problem is investigated. In IGDT, robustness and opportunity functions are used to model RA and RT strategies, respectively. At first, the planning problem is solved via crow search algorithm (CSA) with different flight length patterns (constant, linear, sinusoidal and logarithmic) considering risk-neutral (RN) strategy where the objective function (including investment and losses costs) is minimized subject to the constraints. Then, RA and RT strategies are investigated to maximize and minimize the radius uncertainty, respectively. Over the case study, simulation results reveal the importance of load profile and risk strategies on the planning results. On average, CSA with linear flight length finds more promising results than the other investigated patterns.

Keywords Distribution network planning, Information gap decision theory, Risk-averse strategy, Risk-taker strategy, Crow search algorithm with linear flight length.