M. Eslahi, B. Vahidi and P. Siano, Novel Time-Varying Risk-Averse and Risk-Seeker Frameworks for Uncertain Wind Energy Generation in Electric Power Systems, *IEEE Access*, doi: 10.1109/ACCESS.2024.3505258.

Abstract To achieve a more reliable strategy for power systems, the stochastic behavior of uncertain parameters should be considered. Numerous frameworks have been proposed to derive robust solutions against uncertain resources. Information Gap Decision Theory (IGDT) has been exploited as a robust approach to address the immunized decision-making variables against uncertainties in the power system operation. The mechanism of this method is based on the radius of uncertainty for the uncertain parameter. The IGDT has two main disadvantages, firstly, one value for the radius of uncertainty is derived for the different time intervals, which cannot be practical. Secondly, in the Risk Seeker-based IGDT, the limitation of maximum generated power by the Wind Turbine (WT) is not taken into account. To tackle the first drawback, an approach called Weighted-IGDT was proposed for a Micro Grid (MG), on the other hand, this technique is extremely non-linear. Consequently, for large transmission networks, the global optimal solution is not achievable. In contrast, the proposed MILP-based Risk-Averse and Risk-Seeker methodologies fill these gaps. In this paper, the radius of uncertainty is reported for each time interval by proposed mathematical architecture, which 24 objectives (radii of uncertainty) have been optimized. Thus, global optimal status can be guaranteed, furthermore, it can be more realistic that the decision-makers have robust conservativeness/opportuneness factor for each hour. Moreover, the accuracy and time efficiency of the proposed framework have been proven by implementing Monte Carlo Simulation for the IEEE 30 bus power system, as the case study of this paper.

Keywords Uncertainty; Stochastic processes; Wind power generation; Optimization; Power system stability; Decision making; Renewable energy sources; Linear programming; Power system reliability; Pareto optimization; uncertain wind power generation; time-varying IGDT; time-varying conservativeness factor; time-varying opportuneness factor.