A robust optimisation framework in composite generation and transmission expansion planning considering inherent uncertainties

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Abstract-

This paper presents a robust optimisation framework for long-term composite generation and transmission expansion planning problem which considers inherent uncertainties such as load growth, fuel cost and renewable energy output uncertainties. In this paper, a bi-level robust optimisation framework is proposed to accommodate wind output uncertainty in line with the uncertain demanded loads and uncertain fuel cost. The addressed optimisation problem is modelled as a mixed-integer optimisation framework with the objective of providing a robust expansion plan while maintaining the minimum cost expansion. In order to evaluate the robustness of each plan, an off-line Lattice Monte Carlo simulation technique is adopted in this study. The validity of the proposed method is examined on a simple six-bus and modified IEEE 118-bus test system as a large-scale case study. The simulation results show that the presented method is both satisfactory and consistent with expectation.

Index Terms- Generation and transmission expansion planning; inherent uncertainties; off-line lattice Monte Carlo simulation; robust optimisation

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