Mohammad Salimi; Yuzhong Gong; Rajesh Karki; Chi Yung Chung, 2025, Two-Stage Resilience-Oriented Unit Commitment of Transmission Systems Against Severe Windstorms, *IEEE Transactions on Power Systems,* early access.

Abstract This paper presents a two-stage unit commitment (UC) model to boost the resilient operational planning of transmission systems against upcoming windstorms. UC scheduling, load curtailment, and repair crew dispatch (RCD) are coordinated in two stages to inform all phases of the resilience trapezoid. Transmission line failure probabilities are calculated using the forecasted wind and component fragility curves. In the first stage, a conservativeness-controlled info-gap (CCIG)-based model is proposed to provide cost-robustness tradeoffs for decision-makers by solving the resilient UC (RUC) problem. Given the realized first-stage decisions, a novel UC-integrated RCD (UCRCD) formulation is presented in the second stage, which employs repair crew teams (RCTs) to minimize load curtailment by scheduling the repair of damaged lines during the UC horizon. The model is further developed to incorporate the RCD rescheduling on a rolling-horizon basis as the event progresses through the system and the damage information is updated. The proposed model is tested on the modified IEEE RTS-79 and IEEE RTS-96 test systems, showing its efficacy in providing optimal cost-robustness tradeoffs for mildly, moderately, and seriously conservative decision-makers and updating restoration schemes according to the new damage information. The results are verified using a sequential Monte Carlo (MC) simulation with 2000 scenarios.

\website\IGT\salimi-etal2025abs.tex 28.7.2025