

Songyu Gao; Zemin Liang; Qi Yao, 2026, A Review of Modeling for Uncertainty Factors in New Power System Optimal Dispatch Problems, Preprints of 2025 IEEE 4th International Conference on Industrial Electronics for Sustainable Energy Systems (IESES), September 22–24, 2025. Beijing, China.

**Keywords** power systems, uncertainty modeling, renewable energy.

### **Abstract**

During the development of new power systems, the penetration rate of renewable energy has increased significantly, grid structures have become increasingly complex, and fluctuations in load demand have become more pronounced. All segments of the system, including generation, transmission, and load, are facing heightened impacts of uncertainty, which adversely affect the solving of various optimal scheduling problems in power systems such as unit commitment, power balance, and system stability. Therefore, based on existing research, this paper reviews the uncertainty factors and modeling methods in new power systems, with a focus on research advances in scenario-based methods, uncertainty set methods, membership function methods, robustness-based methods, and opportunity functions in the context of related optimal scheduling problems. Furthermore, it proposes prospects for the development of uncertainty modeling research. Ultimately, this review aims to provide a summary of ideas and inspiration for modeling uncertainty in the future optimal scheduling of new power systems. [The paper develops info-gap robustness and opportuneness functions.]