

Abstract

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Bridging Conventional and Renewable Power: Advanced Strategies for a Stable, Future-Ready Grid

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Abstract

The electrical grid connects both conventional and renewable energy sources, as well as the demand side while maintaining stability under all conditions. However, with the growing integration of renewables and the increased demand from electric applications such as electric vehicles and heat pumps, the grid faces unprecedented challenges. Aging infrastructure, growing requirements for system observability, and the transition towards an inverter-based renewable systems intensify these concerns. To meet these challenges, we must develop and implement innovative methods for real-time grid status assessment. Emerging technologies, such as artificial intelligence and quantum computing, show great potential for enhancing state estimation in these complex environments. Additionally, future-proofing the grid through research into its resilience and stability will be essential to ensuring reliable operation in a renewable-powered future. This presentation explores these critical issues and highlights the advanced strategies necessary for securing the future of the electrical grid.