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Abstract

Title: From Microgrids to Smart Interlinked Systems: Next-Generation Energy Management

This tutorial, presented by Dr. Javad Khazaei and Dr. Faegheh Moazeni, offers a comprehensive overview of microgrids, advanced energy management strategies in microgrids, and their extension to interlinked infrastructure systems such as water-energy microgrids. The session begins with an introduction by Dr. Khazaei, focusing on the fundamentals of microgrid operation, optimization, and control. Topics will include modeling inverter-based resources (IBRs) and their constraints, energy scheduling problems in microgrids including economic dispatch and optimal power flow. Attendees will gain hands-on experience with MATLAB modeling and coding, learning to implement and simulate optimization algorithms for microgrid energy management.

Building on these foundations, Dr. Moazeni will expand the discussion to the co-optimization and control of interdependent infrastructures, emphasizing the unique challenges and opportunities in integrating water and energy systems. The session will explore state-of-the-art modeling approaches, cyber-physical interdependencies, and real-time decision-making frameworks that enhance operational resilience and efficiency.

By the end of this tutorial, participants will understand the theoretical principles, computational tools, and practical applications of energy management across microgrids and their interconnected systems. The session is designed for students, researchers, engineers, and practitioners seeking to deepen their knowledge in microgrid management and integrated infrastructure optimization..