Special Session 11: AI for Microgrid Resilience: A Data-Driven and Model-Free Approach

Session Organizers:

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Brief Description of the Session Thematic:

Extreme weather events, known for their high impact and low probability, can significantly disrupt power systems, leading to extensive outages. The integration of renewable energy resources as part of decarbonization efforts introduces additional challenges due to their intermittent and fluctuating nature, exacerbating the effects of such events. To address these challenges, resilience has been incorporated into the power industry, aiming to ensure the continuous supply of essential loads, like hospitals and data centers, during extreme events. Microgrids are expected to play a crucial role in future power systems due to their self-controlling, self-protection, and self-healing capabilities. They can maintain energy supplies during national blackouts and enhance grid resilience through smart coordination between national and local systems. Networked microgrids (NMGs), which interconnect multiple microgrids, further improve resilience by enabling efficient energy sharing. Mobile power sources (MPSs), including emergency mobile generators, mobile energy storage systems, and electric vehicles, are valuable for their mobility and flexibility. They can support essential services during outages and coordinate with repair crews for system restoration. To manage the complexities of integrating NMGs, MPSs, and repair crews, data-driven AI approaches like reinforcement learning (RL) are promising. RL can dynamically learn and adapt to system conditions, making it an effective solution for real-time decision-making in load restoration processes, without requiring prior knowledge of the system.

Topics and Keywords:

1. Resilience enhancement of energy supplies via microgrids
2. Enhanced flexibility and mobility of mobile sources for resilience enhancement
3. Application of reinforcement learning to microgrid control
4. Coupled power and transportation systems
5. Fast load restoration process via distributed resources