
Electrical & Computer Engineering
S E M I N A R
Louisiana State University

**Dynamic Microgrid Framework for
Planning and Execution of Distribution
System Black Start and Restoration**

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Abstract—Distribution utilities have traditionally relied on diesel generators to perform black start and restore loads following outages. However, with aging generator fleets and rising fuel costs, there is increasing interest in black start and restoration strategies that leverage Distributed Energy Resources (DERs). This seminar presents a dynamic microgridbased framework that initiates black start using multiple grid-forming (GFM) DERs, followed by the coordinated expansion of microgrids to integrate grid-following (GFL) DERs, pick up loads, and enable synchronization among microgrids (MGs). A key innovation of this framework is its ability to achieve reliable synchronization among MGs, allowing them to share energy and power capacity and support loads larger than what individual MGs could supply independently. The approach employs virtual synchronous generator-based control for GFM DERs and leverages this control structure to predict key frequency response metrics—such as quasisteady-state frequency, rate of change of frequency, and frequency nadir—during load pickup events using only the initial and final quasi-steady-state operating points. The overall framework is formulated as a Mixed-Integer Quadratically Constrained optimization problem that determines the optimal sequence of energizing and synchronizing switching actions needed to restore the distribution grid while maintaining voltage and frequency security. Finally, the seminar will highlight practical use cases of this framework, including black start resource allocation planning and Model Predictive Controlbased execution of restoration switching strategies.

Bio—Salish Maharjan (Senior Member, IEEE) received the Ph.D. degree in Electrical and Computer Engineering from the National University of Singapore in 2020. He is currently a Research Assistant Professor with the Department of Electrical and Computer Engineering at Iowa State University. His research interests include distribution system modeling, stability analysis, and optimization and control for techno-economic operation and resilience enhancement. He is the recipient of the Best Paper Award at the 2023 and 2025 IEEE Power & Energy Society General Meetings.

When: **Thursday, 22 January 2026, 10:00 - 11:00**
Where: **Room 3316E Patrick F. Taylor Hall**
Info: <https://www.lsu.edu/eng/ece/seminar>
Food: **Refreshments will be served.**

