



TEXAS A&M UNIVERSITY

Department of Electrical  
& Computer Engineering

**Friday, April 1, 2022 | 9:10 – 10:00 a.m. Central**

Location: ETB 1020

# A Multi-Objective Adaptive Policy Search Approach for Microgrid Energy Management

## Abstract

Microgrids are emerging as an effective and adaptive infrastructure option to promote distributed energy resource (DER) integration, and to engage end-use customers in efficient and responsive energy use. A major challenge of managing microgrids is to identify energy dispatch strategies that accommodate multiple conflicting objectives from diverse stakeholders and are robust to the significant uncertainties confronting their operations. Our study adopts the Evolutionary Multi-Objective Direct Policy Search (EMODPS) method and modifies it to be a multi-agent multi-objective evolutionary algorithm reinforcement learning framework to handle the daily energy management problem. We quantify the performance tradeoffs between economic profit, environmental impact, and reliability of the system operation for different parametrized microgrid control policies on the Cornell University microgrid as a test case. We demonstrate that the non-dominated alternative policies provide better control strategies than the current operation with adaptive performance to exogenous information. We further open the black box to interpret the high dimensional parameterized control policies and to show how, why, and when the exogenous information is being used by the optimized policies. The proposed framework provides *a posteriori* analysis with an appropriate representation of stakeholder and climate priorities in the design and operation of microgrids, fostering positive outcomes for climate and society in general.



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C. Lindsay Anderson obtained her PhD in Applied Mathematics from Western University (Canada) and B.Sc. and M.Sc. in Engineering from University of Guelph (Canada). She is an Associate Professor and the Interim Director of the Cornell Energy Systems Institute at Cornell University. Previously, Lindsay was the Kathy Dwyer Marble and Curt Marble Faculty Director for Energy with the Cornell Atkinson Center for Sustainability. Her research interests are the application of optimization under uncertainty to problems in sustainable energy systems, and has been funded by the National Science Foundation, the US Department of Energy, PSERC, Cornell Atkinson Center for Sustainability, and the National Science and Engineering Research Council of Canada.