

Department of Electrical and Computer Engineering

Title: *“Resilient Architectures and Algorithms for Generation Control of Inertial-Less AC Microgrids”*

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Abstract:

This talk discusses the problem of frequency regulation in islanded ac microgrids with no inertia, i.e., those consisting entirely of generators interfaced through power electronics. The control architecture we propose to achieve this is designed to drive the average frequency error to zero while ensuring that the frequency at every bus is equal and that the operating point that results is stable. We also introduce a distributed implementation of the proposed control architecture that relies on a combination of several distributed algorithms. Collectively, these algorithms eliminate the need for a centralized entity with complete knowledge of the network, its topology, or the capabilities or properties of the generators and loads therein. Moreover, the distributed implementation we propose relies on minimal measurements, requiring only that the power injection at each bus be measured. Additionally, by eliminating the need for a centralized processor and a communication network connecting it to each generator, these distributed approaches can achieve higher system-level reliability, adaptability, and resilience.

Biography:

Alejandro Dominguez-Garcia is an Associate Professor in the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign, where he is affiliated with the Power and Energy Systems area. Also within ECE Illinois, he has been a Grainger Associate since 2011, and a William L. Everitt Scholar since 2017. He is also an Associate Research Professor in the Coordinated Science Laboratory and in the Information Trust Institute, both at the University of Illinois (U of I). His research program aims at the development of technologies for providing a reliable and efficient supply of electricity, a key to ensuring societal welfare and sustainable economic growth. Specific activities within his program include work on: (i) control of distributed energy resources, (ii) grid data analytics, and (iii) reliability analysis. Dr. Dominguez-Garcia received the Ph.D. degree in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology, Cambridge, MA, in 2007, and the degree of “Ingeniero Industrial” from the University of Oviedo (Spain) in 2001. Dr. Dominguez-Garcia received the NSF CAREER Award in 2010, and the Young Engineer Award from the IEEE Power and Energy Society in 2012. In 2014, he was invited by the National Academy of Engineering to attend the US Frontiers of Engineering Symposium, and was selected by the U of I Provost to receive a Distinguished Promotion Award. In 2015, he received the U of I College of Engineering Deans Award for Excellence in Research. He is an editor of the IEEE TRANSACTIONS ON POWER SYSTEMS and the IEEE POWER ENGINEERING LETTERS.