Beyond Low-Inertia Systems: Grid-Forming Control Foundations for Converter-Dominated Power Systems

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OVERVIEW

At the heart of the transition to a zero-carbon power system is a technological paradigm shift from conventional generation to renewable generation connected to the grid via power electronics. In this context, the literature and public debate mostly focus on the variability and intermittency of renewable generation and loss of machine inertia. At the same time, the rapid and massive integration of power electronics and renewables results in significantly different power system dynamics and challenges standard operating, control, and analysis paradigms. This talk will focus on a universal grid-forming control paradigm that is compatible with a wide range of emerging and legacy power generation, conversion, and transmission technologies and enables rigorous end-to-end stability analysis of tomorrow's complex power system dynamics. The talk will conclude with a brief discussion of challenges in control and stability analysis that need to be resolved to enable reliable and resilient zero-carbon power systems.

BIO

Dr. Dominic Gross is an Assistant Professor with the Department of Electrical and Computer Engineering at the University of Wisconsin-Madison, Madison, WI, USA. He received his Ph.D. degree in Electrical Engineering from the University of Kassel, Germany, in 2014. Prior to joining UW-Madison, he was a postdoctoral researcher at the Automatic Control Laboratory of ETH Zürich. He received an NSF CAREER award in 2022. His research interests include distributed control and optimization of complex networked systems with applications in dynamics of power systems dominated by power electronics, renewable generation, and energy storage.