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

**Robust, Reliable, Efficient, and Smart Grid-Interactive
Interfaces for Distributed Energy Resource (DER) Application**

Masoud Karimi

University of Toronto, Ontario

Abstract—The electric power system is experiencing a major transformation. The distributed energy resource (DER) technology is proliferating with the global objective of overcoming the problems with the existing way of electricity production and transmission. The full integration of the DER and the electric vehicle technologies is the path to reaching this objective. While more of the central power plants are being retired, the backbone of the power grid including the transmission and distribution infrastructure must be properly upgraded and modernized to enable such full integration. Smart metering, reliable and secure data processing and communication, intelligent protection, and advanced centralized and decentralized management and control systems must all synergize towards this goal.

The power electronic interface used in a DER technology governs its interaction with the rest of the power and energy network. A desirable interface must be able to perform within a wide range of system parameters and conditions (i.e., to be robust), withstand system failures (i.e., to be reliable), have low power loss (i.e., to be efficient), and provide intelligent responses without being too complicated or too expensive (i.e., to be smart).

This presentation covers some of our past and ongoing research efforts to enable the power electronic interfaces to possess such properties. The following topics will be presented: 1) advanced grid synchronization tools, 2) robust synchronization to weak and dynamic terminals, 3) dc-link natural inertia emulation, 4) grid-balancing inverters, 5) distributed PV-battery synergy, and 6) smart dc-link capacitors.

Bio—Masoud Karimi received his PhD in Electrical Engineering from University of Toronto, Ontario, in 2004. Then, he respectively became a faculty member at Sharif University, Tehran, and a research associate at ePOWER, Queen's University, Canada, before joining Mississippi State University (MSU) in 2012. He is currently a tenured associate professor in the ECE department at MSU where he teaches the courses in power and control areas and also advises the students' research works. His research area expands over several domains of electrical engineering with the focus on the integration of distributed and renewable energy systems. Together with his colleagues and graduate students, he has identified and researched several challenges pertaining to synchronization and control of such energy systems. Some of their research developments have already been used by the industry. Dr. Karimi also developed a new graduate course at MSU on the modeling and control aspects of DER interface technologies. Dr. Karimi is a senior member of IEEE with which has over hundred publications and a monograph on the grid synchronization techniques. His second monograph on the modeling and control of DER systems is under preparation.

When: Thursday, 23 January 2020, 10:00 - 11:00

Where: Room 3285 Patrick F. Taylor Hall

Info: <https://www.lsu.edu/eng/ece/seminar>

