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Title: *«Decentralized Control and Coordination of Distributed Resources for Emerging Applications in Electric Power Systems »*

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Abstract:

On the distribution side of an electric power system, there exist many distributed resources (DRs) that can be potentially used to provide ancillary services to the grid they are connected to. An example is the utilization of plug-in-hybrid vehicles (PHEV) for providing active power for up and down regulation. Proper coordination and control of DRs is key for enabling their utilization in the procurement of these ancillary services. One solution to this coordination and control problem can be achieved through a centralized control strategy where each DR is commanded from a central decision maker. An alternative solution—and the one this talk will focus on—is to distribute the decision-making process among the DRs. In order to achieve so, the DRs need to exchange information with a number of other "close-by" DRs, and subsequently make a local decision based on this available information. In this talk, we discuss the problem of dispatching a set of distributed resources (DRs) without relying on a centralized decision maker. We propose low-complexity iterative algorithms for DR dispatch that rely, at each iteration, on simple computations involving local information acquired through exchange of information with neighboring DRs. In general, the goal is for the DRs to collectively provide a certain amount of a resource (e.g. active or reactive power). We address two different problems: (i) the constrained fair-splitting problem, in which the amount of resource that each DR can provide is limited by capacity constraints, but there is no cost associated to the amount of resource provided; and (ii) the constrained optimal dispatch problem, in which there are constraints on DR upper and lower capacity, and each DR has associated a quadratic cost. We illustrate the application of the proposed algorithms to the problems of generation control in microgrids and voltage control in distribution networks.

Biography:

Alejandro Dominguez-Garcia is an Associate Professor in the Electrical and Computer Engineering Department at the University of Illinois, Urbana, where he is affiliated with the Power and Energy Systems area. His research interests lie at the interface of system reliability theory and control, with special emphasis on applications to electric power systems and power electronics. 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 Electrical Engineer 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. He is an editor of the IEEE Transactions on Power Systems and the IEEE Power Engineering Letters. He is also a Grainger Associate since August 2011.