On the distribution side of a power system, there exist many distributed energy resources (DERs) that can be potentially used to provide ancillary services to the grid they are connected to. An example is the utilization of power electronics grid interfaces commonly used in distributed generation to provide reactive power support. While the primary function of these power electronics-based systems is to control active power flow, when properly controlled, they can also be used to provide reactive power support. Another example is the utilization of plug-inhybrid vehicles (PHEV) for providing active power for up and down regulation. For instance, such resources could be utilized for energy peak-shaving during peak hours and load-leveling at night. Proper coordination and control of DERs is key for enabling their utilization for ancillary services provision.

In this talk, we discuss distributed algorithms for decentralized DER coordination that rely on linear iterations, and that adhere to a network communication model between DERs that is described by a directed graph. Given a total amount of resource that the DERs must collectively provide, we address three different problems: i) there are constraints on DER capacity but the objective function is identically zero—constrained fair-splitting dispatch problem; ii) there are no constraints on DER capacity, and there is some quadratic cost associated to each DER—unconstrained optimal dispatch problem; and iii) there are constraints on DER upper and lower, and there is some quadratic cost associated to each DER—capacity-constrained optimal dispatch problem.

Biography

Alejandro Domínguez-García is an Assistant 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. Domínguez-García 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.

After finishing his Ph.D., he spent some time as a post-doctoral research associate at the Laboratory for Electromagnetic and Electronic Systems of the Massachusetts Institute of Technology. Domínguez-García received the NSF CAREER Award in 2010, and the Young Engineer Award from IEEE Power and Energy Society in 2012. He is an editor of the IEEE Transactions on Power Systems. He is also a Grainger Associate since August 2011.