

Seminar Talk

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Friday, April 3, 2015
3:00 p.m. KH 224

Title: Coordinated Charging of Plug-In Electric Vehicles in Smart Grids

Abstract:

Utilities are becoming concerned about the potential stresses, performance degradations and overloads that may occur in distribution systems with multiple domestic plug-in electric vehicle (PEV) charging activities anticipated in the future. Uncontrolled and random PEV charging can cause increased power losses, overloads and voltage fluctuations, which are all detrimental to the reliability and security of newly developing smart grids. Therefore, a real-time smart load management control strategy is proposed for the coordination of PEV charging based on real-time (e.g., every 5 minutes) minimization of total cost of generating the energy plus the associated grid energy losses. The approach reduces generation cost by incorporating time-varying market energy prices and PEV owner preferred charging time zones based on priority selection. The coordination algorithm considers random plug-in of PEVs and utilizes the Maximum Sensitivities Selection (MSS) optimization method. This approach enables PEVs to begin charging as soon as possible considering priority-charging time zones while complying with network operation criteria (such as losses, generation limits and voltage regulation). Results are presented to demonstrate potential performance gains for a modified IEEE 23 kV distribution system connected to several low voltage residential networks populated with PEVs.

Bio:

Dr. Moses is currently working as an Assistant Professor at Old Dominion University contributing to R&D activities and curriculum development in marine engineering as part of ODU's Naval Engineering and Marine Systems Institute (NEMSI). Prior to working at ODU, Dr. Moses worked for over 4 years full-time in the Defense Science and Technology Organization (DSTO), Australian Department of Defense. He was an Electrical Power Systems Engineer in DSTO's Power and Energy Systems Group, Maritime division. He provided R&D expertise and engineering support to several naval projects in submarines and surface vessels. He has practical experience in electric propulsion systems, power conversion and transformers, energy storage technologies, power generation, and ac/dc marine power distribution systems. He has served as an expert on technical investigation boards for root-cause failure analysis of multi-megawatt power components in naval ships. Dr. Moses was also a researcher at the Center for Smart Grid and Sustainable Power Systems, Curtin University, Australia, where he gained his doctoral degree in Electrical Power Engineering. He has worked on several projects involving smart grids and plug-in electric vehicles which will be covered in his talk.