IEEE Ottawa Section

DoE Seminar Series in collaboration with IEEE CASS/EDS/SSCS Ottawa Joint Chapters, IEEE PES Ottawa Chapter, and IEEE ComSoc/BTS/CES Ottawa Joint Chapter are inviting all interested IEEE members and nonmembers to a seminar on

Coordinated Control Strategy and Energy Optimization in Smart Grid

by

Dr. Hasan Mehrjerdi, Industrial Postdoctoral Fellow at Research Institute of Hydro-Quebec (IREQ), Varennes, Canada

DATE: Friday January 20, 2012
TIME: Registration, Refreshments & Networking: 12:45 pm.; Seminar: 1:00 pm - 02:00 pm
PLACE: **ME 4124**, Mackenzie Engineering Building, Carleton University, Ottawa, On., Canada
ADMISSION: Free. Registration required. To ensure a seat, please register by e-mail contacting: Ram Achar at achar@doe.carleton.ca, or Wahab Almuhtadi at almuhtadi@ieee.org.

Abstract

Energy is one of the top priorities in the world and smart grids are the centerpiece of this energy focus. Grid design, control and stability are the main objectives of smart grid technology in order to enhance the voltage stability of electric power distribution systems during faulty conditions and disturbances. Analysis and benefits of implementing smart grids based on multi-agent systems (MAS) show that it is a suitable technology for the complex and highly dynamic operation of a power system network. The existing power grid suffers from the lack of pervasive and effective communications, monitoring, fault diagnostics, and automation control, which further increase the possibility of a region-wide system breakdown due to the cascading effect that can be initiated by a single fault. Currently, for the power system, voltage control systems are centralized and operated through a central computer which supervises the output of all generators and adjusts optimally the voltage set points of these generators. This centralized regulation algorithm must know the whole network configuration and therefore for a large-scale power system, it may become difficult to perform a centralized control system. This motivates us to study and find efficient and secure voltage control mechanism in a power system by identifying the most appropriate controls based on decentralized and distributed control. This presentation firstly presents a definition and vision of the smart grid and its key areas including: Sensing and Measurement, Advanced Control Methods, Advanced Components and Integrated Communications. Secondly, an optimal electrical network graph partitioning technique is presented that divides a power network into appropriate regions to eventually prevent the propagation of disturbances and minimize the interaction between these regions. The optimized number of partitions is found based on the bus voltage sensitivity to the disturbances being applied to the loads in each region. A number of representative buses which are labeled as pilot buses are established and these are identified in each region displaying the critical point for secondary voltage control. The graph theory applied to this situation has the ability to simplify and decompose large connected power networks.

Biography

Hasan Mehrjerdi received the B.Sc. degree in Electrical Engineering from Ferdowsi University of Mashhad, Mashhad, Iran, the M.Sc. degree in Power System Engineering from Tarbiat Modares University, Tehran, Iran, and a Ph.D. in Electrical Engineering as a member of the Power Electronics and Industrial Control Research Group (GREPCI) from Quebec University (ETS), Montreal, QC, Canada, in 2010.

In 2005, he was with the Power Research Institute (Electrical Machinery Group), Tehran, Iran and then in 2006, he worked as a research assistant with Renewable Energy and Power Electronics group at Moncton University, Moncton, Canada on a project related to the Power Flow Optimization for Fuel Cell Electrical Vehicle (FCEV).

Currently, he is an Industrial Postdoctoral Fellow at Research Institute of Hydro-Quebec (IREQ), Varennes, Canada. He is a member of Electrical Network and Mathematics group and his research interests are in power systems, smart grid, multi-agents control and coordination, and renewable generation.