Holcombe Department of Electrical and Computer Engineering
Seminar Series

Dynamic Operation and Control of Multi-dg Stand-Alone Microgrid

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Abstract

A part of an electric power system can operate as a standalone system without any connection to the main grid. Such autonomous systems include dedicated power systems for rural areas, moveable military bases and facilities requiring premium power quality. For the proper calculation and control operation of autonomous generation systems, the dynamics of the power sources and the loads must be properly accounted for thorough adequate system modeling. In this paper, a photovoltaic (PV) system and a battery bank are presented as energy sources, which with the aid of converters, provide electric power to three-phase balanced stand-alone loads. With the aid of DC-DC converters, source output powers and the DC link voltage are controlled. A three-phase DC-AC inverter converts the input DC voltage to AC and controls the frequency and magnitude of the load voltage. The modeling and steady state operation of the system are set forth under various operating conditions while accounting for the nonlinearity of the PV source and load type. Besides, the maximum power point tracking algorithm of the solar system is added. The controller design and structures are explained in details and the dynamic behavior of the whole system is studied by computer simulations.

Biography of Speaker

Olorunfemi Ojo (M’87, SM’95, F’10), a Fellow of the Institute of Electrical Engineers, (FIEE) was born in Kabba, Nigeria. He received the Bachelor’s and Master’s degrees in electrical engineering from Ahmadu Bello University, Zaria, Nigeria, and the Ph.D. degree from the University of Wisconsin, Madison. He is currently the TVA Chair Professor of electrical and computer engineering at Tennessee Technological University, Cookeville. His current research interests span the areas of electric machine analysis and drive control, switching converter technology, and modern control applications in converter-enhanced power and distributed energy generation systems.

Ojo is presently the Vice Chairman of the Industrial Power System Department (IPCSD) of the IEEE Industry Applications Society. He is also an Associate Editor of the IEEE TRANSACTIONS ON POWER ELECTRONICS and serves on the Editorial of the IET PROCEEDINGS ON POWER ELECTRONICS. Dr. Ojo is a Fellow of the UK based Institute of Electrical and Electronics Engineers (FIEE).