Coordinated Control and Optimization of DC Power Systems

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Abstract

Recently, DC microgrids have been extensively investigated and many advanced system control and management techniques have been developed. These methods have been applied to applications such as electric traction, smart buildings, aircraft and shipboard power systems. During the last decade, it has been shown that DC power systems can bring a lot of benefits to both commercial and mission-oriented ships. With the rapid development of modern power electronic technologies, DC distribution systems have become attractive over the conventional AC-based systems.

Despite many advantages offered by DC-based Integrated Power System, it is still a challenging task to continuously maintain system stability and optimized overall fuel economy with a highly dynamic load profile. Also, coordination between the real-time controllers and system optimizer has been quite difficult in these conditions. In this seminar, a novel methodology will be introduced to control and optimally reconfigure a DC power system automatically detecting the system disturbances. The proposed method includes autonomous reconfiguration and self-healing to optimize the system performance. Under supervision of Associate professor Dr. Jae-do Park, a DC-bus distribution system developed for the U.S. Coast Guard’s 270-ft Medium Endurance Cutter using Simulink’s Simscape toolbox. CPLEX/MATLAB API was used to achieve bidirectional communication between the controller and optimization systems. A number of simulation results will be presented to demonstrate the feasible, efficient and robust performance of the proposed system.

Bio. Md Habib Ullah received the B.Sc. degree from Ahsanullah University of Science and Technology, Dhaka, Bangladesh and the M.Sc. degree in electrical engineering from South Dakota State University, SD, USA in 2012 and 2016 respectively. Currently, he is pursuing the Ph.D. degree in the University of Colorado, Denver and working on Dr. Jae-do Park’s NSF project entitled “Smart Protection for DC Power Systems: Distributed and Proactive Approach”. His research interests include energy management, self-healing MTDC, power system restoration and protection.

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