ECE – 590 I
POWER & ENERGY SYSTEMS SEMINAR

Monday, September 28, 2015, 4:00 – 5:00 p.m., Room 3017, ECEB

Progress of NASA Learn Superconducting Machine Project

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Abstract

NASA Learn is exploring high power density electrical machines technologies as an enabling component for electric flight. Superconducting electric machines open up a new design space for power density, with magnetic fields 3-5x that of conventional topologies. An actively shielded air-core machine topology is proposed as a solution to field containment issues, enabling an order of magnitude increase in power density. Electromagnetic, structural and thermal analyses of the device have been explored. Next steps include manufacture of a sample superconducting winding as a proof of concept.

Distribution System State Estimation using Semidefinite Programming

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Abstract

Growing penetration of distributed energy resources connected to power distribution networks necessitate accurate, robust, and dependable real-time system monitoring tools. This paper considers the state estimation (SE) problem in distribution systems and proposes a convex relaxation based approach to solve it as a semidefinite programming (SDP) problem. Even with a simple 4-bus case, we have identified that existing approaches such as the iterative Newton's method are more prone to convergence issues when measurement quality varies more significantly across different sources. By relaxing the SE problem to a convex SDP, the proposed method has the potential to closely attain the globally optimum solution without suffering from numerical issues caused by the inclusion of e.g., 'virtual measurements' at zero-injection nodes. Numerical tests have been performed on the IEEE 4-bus and 13-bus test feeder cases to demonstrate the feasibility and effectiveness of the proposed approach.