Risk-Sensitive Security-Constrained Economic Dispatch via Critical Region Exploration

Avinash Madivan
Electrical and Computer Engineering, UIUC

Abstract
A security-constrained economic dispatch (SCED) problem is regularly solved by system operators in electric power networks to make day-ahead and real-time dispatch decisions. Preventive SCED is conservative and requires dis-patch decisions that are secure against any single component failure. Corrective (recourse) actions can significantly reduce operational costs. Even with linear power flow models, corrective SCED poses significant computational challenges owing to an increase in the dimensionality arising from additional recourse decisions and the number of contingencies to guard against. In this presentation, I will describe a novel risk-sensitive formulation for SCED that captures the tradeoff between cost and reliability. I will also demonstrate an algorithm that tackles the computational challenges of solving the problem at scale through a decomposition of the problem via a critical region exploration technique that exploits the problem structure using properties of multi-parametric linear programming.

Feasibility Study and Optimal Design of A 10MW Air-Core Fully SC Machine for Offshore Wind Turbine

Theepan Balachandran
Electrical and Computer Engineering, UIUC

Abstract
I will present my research on “Feasibility study and optimal design of a 10MW air-core fully SC machine for offshore wind turbine”. This machine design is considered with armature coils inside and rotating field coils outside. In this topology, shield iron is eliminated or reduced by replacing it with shield coils which contain the magnetic flux within the machine. This machine is attractive for offshore wind turbine application due to its high-power density and high efficiency compared to the conventional shield iron designs. However, this design uses relatively higher SC material than the conventional shield iron design due to the additional shield coils placed on the outer rotor. An optimal design scheme of combination between shield coils and shield iron will be discussed in the presentation. A detailed ac loss calculation will be discussed with the required cryocooler power and efficiency calculation.