



Operations Research and Engineering Management

Dissertation Defense

Study of Stochastic Market Clearing Problems in Power Systems with High Renewable Integration



Ph.D. Dissertation

Presented by

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Abstract

Integrating large-scale renewable energy resources into the power grid poses several operational and economic problems due to their inherently stochastic nature. The lack of predictability of renewable outputs deteriorates the power grid's reliability. The power system operators recognize the need to account for uncertainty in making operational decisions and forming electricity pricing. This dissertation studies three aspects that aid large-scale renewable integration into power systems. 1. We develop a nonparametric change point-based statistical model to generate scenarios that accurately capture the renewable generation stochastic processes; 2. We design new pricing mechanisms derived from alternative stochastic programming formulations of the electricity market clearing problem under uncertainty; 3. We devise a novel approach to coordinate strategic operations of multiple noncooperative system operators.

Biography

Sakitha Ariyaratne is a Ph.D. Candidate in the Operations Research and Engineering

Management department of Bobby B. Lyle School of Engineering at Southern Methodist University. He received his B.Sc. degree in Statistics and Operations Research from University of Peradeniya, Sri Lanka, in 2015 and his M.Sc. degree in Statistics from the Sam Houston State University, Huntsville, TX, in 2018.