UCF DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Spring 2016 Seminar Series

GRID-SCALE ENERGY STORAGE INTEGRATION IN POWER SYSTEMS: METHODS AND CASE STUDIES

THURSDAY FEBRUARY 18, 2016

11:00 AM – HEC 113

As a result of large-scale integration of renewable generation, electric grids are being operated closer and closer to their technical limits. Lowering security margins demonstrate the urgent need for conceptual reassessment of operating and planning paradigms to timely and reliably meet ambitious state- and nation-wide renewable portfolio targets. This presentation will describe how stochastic renewable generation complicates power system operations and how these challenges can be dealt with by means of emerging energy storage technologies. Specifically, this presentation will focus on the application of mathematical optimization to optimal siting and sizing of grid-scale battery energy storage systems (BESSs) and their operations in power systems with renewables.

BESSs have been proven to be a technically feasible solution to improve utilization of renewable generation. However, the capital cost of such devices remains relatively, if not prohibitively, expensive. This naturally raises concerns over whether BESSs are an economically viable option and can be sustainably integrated in future power systems. This presentation will describe two bi-level models based on mixed-integer linear programming and computationally tractable solution strategies based on the duality approach that can be used to optimize energy storage siting and sizing decisions in a market environment. The use of these models makes it possible to simultaneously respect both the laws of physics (e.g., Kirchhoff's law) and the laws of economics (e.g., the equilibrium of the supply and demand). The usefulness of the proposed method is demonstrated using numerical experiments carried out on the real-life ISO New England and Western Electricity Coordinating Council (WECC) test systems.

YURY DVORKIN

University of Washington

Yury Dvorkin received the B.S.E.E. degree with the highest honors at Moscow Power Engineering Institute (Technical University), Moscow, Russia, in 2011. He is currently a Ph.D. candidate at the Renewable Energy Analysis Laboratory (University of Washington, Seattle). His research interests include short- and long-term planning in power systems with renewable generation, power system economics and policy.

Previously, Yury Dvorkin was a graduate student researcher at Los Alamos National Laboratory's Center for Nonlinear Studies (2014). Yury was a recipient of the Clean Energy Institute's Graduate Fellowship (2013–2014) and the Clean Energy Institute's Student Training & Exploration Grant (2014–2015). In 2014 and 2015 he was recognized as the Outstanding Reviewer by both the IEEE Transactions on Power Systems and IEEE Transactions on Sustainable Energy, the flagship journals in power system engineering.