

Topic: Risk-limiting economic dispatch for electricity markets with flexible ramping products

By Chenye Wu (UC Berkeley) Gabriela Hug (CMU) Soumya Kar (CMU)

Abstract: The expected increase in the penetration of renewables in the approaching decade urges the electricity market to introduce new products - in particular, flexible ramping products - to accommodate the renewables' variability and intermittency. A risk-limiting economic dispatch scheme provides the means to optimize the dispatch and provision of these products. In this paper, we adopt the extended loss-of-load probability as the definition of risk. We first assess how the new products distort the optimal economic dispatch by comparing to the case without such products. Specifically, using parametric analysis, we establish the relationship between the minimal generation cost and the two key parameters of the new products: the up- and down-flexible ramping requirements. Such relationship yields a novel routine to efficiently solve the non-convex risk-limiting economic dispatch problem. Both theoretical analysis and simulation results suggest that our approach may substantially reduce the cost for incorporating the new products. We believe our approach can assist the ISOs with utilizing the ramping capacities in the system at the minimal cost.

Relevance to the theme of CMU conference:

Our work provides a parametric approach to understand the dependency between different parameters in the electricity market. We also provide a way to solve one family of non-convex optimization problems. And this approach can be readily generalized to power system Testbeds, where we try to understand the parameter dependency.

Thanks again for your time in reviewing the abstract.

Best wishes,
Chenye

Chenye WU, Ph.D.
Postdoctoral Research Fellow,
Mechanical Engineering,
University of California at Berkeley
Email: wucy@berkeley.edu