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ON INTERCHANGE SCHEDULING IN MULTI-AREA POWER SYSTEMS: DISTRIBUTED OPTIMIZATION AND MARKET MECHANISM

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Abstract

For historical and technical reasons, different parts of an interconnected power system and its associated assets are usually managed by different system operators (SOs). The internal dispatch in each area has been relatively mature, therefore the overall efficiency of the global system largely depends on the interchange scheduling between different areas. Unfortunately, reports conducted by real system operators indicate that conventional tie-line scheduling techniques have resulted in substantial economic losses, estimated to the tune of $784M for NYISO and ISO-NE between 2006 and 2010.

In this presentation, I will address two aspects of problems relating to this issue. Regarding the algorithm, we have proposed a novel approach to solve the distributed linear or convex quadratic programming. The proposed algorithm converges to the optimal dispatch within a finite number of steps. According to our intuitions and simulations, it is much better in convergence and efficiency than Lagrangian Relaxation or ADMM for large energy systems. Regarding the market mechanism, we have partly answered a key question in the design of electricity markets: Do perfect arbitrations lead to price convergence? Namely, we have generalized the state-of-the-art interchange scheduling model, the coordinated transaction scheduling (CTS), and thereby proved that perfect interface bids asymptotically achieve seamless interfaces between regional markets.

Biography

Ye Guo is a Postdoc Associate at the School of Electrical and Computer Engineering, Cornell University. He received his bachelor degree in 2008 and doctoral degree in 2013, both from Tsinghua University, China. His research interests include distributed optimization, game and market theory, state estimation, and their applications in smart grids and large energy systems. He was recognized as an excellent Ph.D. student by Chinese Education Ministry and received the top-rank scholarship from Tsinghua University.