Guest Editorial
Introduction to the Special Section on Optimization Methods and Algorithms Applied to Smart Grid

W ITH RECENT developments in advanced monitoring, information, and communication technologies applied to smart grid, electric power systems will be able to respond more efficiently to various customer demands, with the objective of making the electricity delivery more reliable, economical and sustainable. The application of smart grid will result in a more complex power grid with uncertain behavior (e.g., two-way digital technology allows providers and consumers to constantly monitor and adjust electricity usage for energy saving, higher power quality, and enhanced system reliability). The ever increasing applications of renewable and distributed energy will add one more dimensional uncertainty and increases the challenges for system operators and users.

This Special Section is intended to bring together the most recent advances in operations research to solve the problems applied to different aspects of smart grid technologies. The articles can either focus on providing new solution methods for the existing models, or developing new models to formulate emerging problems applied to electric power systems. The proposed models of interest should emphasize linear programming, nonlinear programming, mixed integer programming, stochastic optimization, and game theoretical approaches. In response to the call for extended abstracts for this Special Section, 150 two-page extended abstracts were received and reviewed by guest board members. Among those abstracts, authors of 69 selected abstracts were then invited to submit full papers for a second round of review. Finally, out of the full paper submissions, 27 high-quality manuscripts were accepted (from North and South America, Europe, and Asia) and included in this Special Section. The papers in this Special Section cover a wide range of topics including:

- Advanced optimization techniques to solve smart grid operation and planning problems. The methods covered in this Special Section include two-stage stochastic programming, chance constrained programming, robust optimization, and stochastic dynamic programming, among others.
- Models and algorithms for deployment and integration of distributed resources and generation. Topics include real-time scheduling of distributed resources, network capacity assessment of combined heat and power-based distributed generation in urban energy infrastructures, among others.
- Advanced modeling and solution techniques for the security issues applied to smart grid systems. Topics include cyber-physical security regarding humans interacting over control systems, among others.

- Models for development and incorporation of demand response and demand-side management. Topics include stochastic control for smart grid users with flexible demand, among others.
- Models and algorithms for deployment and integration of advanced electricity storage and peak shaving technologies. Topics include robust solution to the load curtailment problem, among others.
- Stochastic control models and technologies to help system operators improve reliability, security, and efficiency of smart grid. Topics include modeling and stochastic control for home energy management, among others.

YONGPEI GUAN, *Guest Editor-in-Chief*
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Sandia National Lab, USA

LEI WU, *Guest Editor*
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