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SPECIAL ISSUE: Quantitative Models for Energy Systems

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Editorial

Technical Papers

New Modeling Tools for Energy Systems

Chung-Li Tseng, Special Editor

The electricity industry has been undergoing major changes. Recent events such as the collapse of Enron, the California power crisis, the great blackout in the East Coast, and the FERC's Standard Market Design, clearly indicate the challenges and complexity embedded by this industrial restructuring that demands new modeling tools for energy planning, operation, and management. This special issue is the first of two devoted to the quantitative models for dealing with systematic issues stemming from these changes. The four papers in this issue provide a broad range of applications in energy systems. The next issue will address impacts of these changes on energy market modeling.

The first paper, "Effects of a Carbon Tax on Combined Heat and Power Adoption by a Microgrid" by Chris Marnay, Jennifer L. Edwards, Ryan M. Firestone, Srijay Ghosh, Afzal S. Siddiqui, and Michael Stadler, analyzes an important issue of distributed generation: how to economically adopt new technologies and new energy resources. The following paper, entitled "Optimal Self–Scheduling of a Tidal Power Plant in a Competitive Pool-Based Electric Energy Market" by Sebastián de la Torre and Antonio J. Conejo, addresses an operational optimization problem of a tidal power plant. Different generating cycles of the tidal power plant are rigorously formulated.

The third paper in this series, entitled "Impact of Phase Shifters on Locational Prices" by Bo Lu, Zuyi Li, and Mohammand Shahidehpour, proposes using phase shifters to mitigate transmission congestion, which can subsequently change locational marginal prices of the network and enhance market competition. The final paper, by Bernard F. Lamond and Abdeslem Boukhtouta, entitled "Neural Approximation for the Optimal Control of a Hydroplant with Random Inflows and Concave Revenues" provides a neural-dynamic programming approach to determine the optimal policy for the control of a hydroelectric reservoir under uncertainty.

With these four papers covering a variety of topics in the modern power energy systems, it is hoped that they can motivate new research on the array of important problems arising in this fast-changing industry.