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EDITORIAL
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Editorial: The Optimization, Modeling and Control Schemes for Integrated Energy Systems

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Editorial on the Research Topic

The Optimization, Modeling, and Control Schemes for Integrated Energy Systems

The integrated energy system (IES) is an intelligent large-scale system, which embraces multiple sources of energy, and utilizes artificial intelligence-based technology to learn users' demands and make optimal decisions in energy transmission. There are still many challenging problems in IES to be addressed. This special issue accepted five papers for publication from open submissions. A summary of these accepted papers is outlined below.

In the paper entitled "Clifford Fuzzy Support Vector Machine for Regression and Its Application in Electric Load Forecasting of Energy System" by Rui Wang et al., the authors proposed Clifford fuzzy support vector machine for regression (CFSVR) to the electric load forecasting in the energy system. It included fitting and sequence forecasting. In a fitting situation, the fuzzy membership reduced the effect of outliers and noise, while in a forecasting situation, the fuzzy membership enabled different points in sequence to have different contributions to the predicted value. Finally, the simulation experiments, UCI data set, the antenna signal data set, the electric load data set, and the NN3 data set, showed that the proposed method has better performance than CSVR and SVR.

In the paper entitled "A locational Marginal Price-Based Partition Optimal Economic Dispatch Model of Multi-Energy Systems" by Jin et al., the authors presented a locational marginal price-based partition optimal economic dispatch model for the multi-energy system. First, the additional cost of multi-energy adjustable units was proposed to improve the capacity of power grid adjustment, considering the power balance between the multi-energy conversion and storage. Based on that, an optimal economic dispatch model was established to minimize the adjustment cost. Second, a solution method based on Lagrangian relaxation was proposed. The incentive-compatible locational marginal price can be obtained. Finally, the simulations of the IEEE 39-nodes power system and 7-nodes natural gas system were discussed. The results showed that the proposed method can effectively improve the efficiency and flexibility of the multi-energy system.

In the paper entitled "Optimality Condition and Distributed Optimization for Economic Dispatch Using a Novel Weighted Incremental Cost Consensus Approach" by Alvi et al., the authors presented a distributed optimization approach that distributed weighted incremental cost consensus, to ensure optimality using weighted incremental cost (ICs) consensus and sign consensus error convergence. The proposed approach had been applied to the IEEE-30 bus systems and the IEEE-118 bus systems. The results indicated the efficacy of weights to address generation constraints and the convergence of weighted ICs under supply-demand balance.

In the paper entitled "The Output Consensus Problem of DC Microgrids With Dynamic Event-Triggered Control Scheme" by Geng et al., the authors studied the output consensus problem of DC

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microgrids with a dynamic event-triggered control scheme. Then, the multi-agent systems function model for DC microgrids was proposed, which included the non-periodic and periodic dynamic event-triggered control schemes. The series of numerical examples proved that the proposed method could make the system achieve output consensus and avoid the Zeno-behavior successfully.

In the paper entitled "Optimal Planning of Integrated Energy System Considering Convertibility Index" by Ying Wang et al., the authors proposed a new index -convertibility index (CI)—to quantitatively assess the flexibility of the IES, regarding the energy conversion processes between different energy flow types. Considering CI constraints, a hybrid genetic algorithm MILP was developed for the bi-level optimizations. Case studies were carried out to verify the effectiveness of the proposed method.

In conclusion, we would like to thank all the authors who submitted their original articles to our Research Topic. We highly appreciate the contributions of the reviewers for their suggestive comments. We would also like to acknowledge the guidance from the Editor-in-Chief and staff members of Frontiers.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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