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Editorial: Advances in distributed energy resources aggregation for the low carbon future

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Editorial on the Research Topic
Advances in distributed energy resources aggregation for the low carbon future

To realize low carbon energy systems, a large number of Distributed Energy Resources (DERs), including energy storage systems, electric vehicles, and flexible loads have been integrated into power grids, from transmission systems to distribution networks. However, system reliability is facing severe challenges due to the intermittency of distributed energy resources. In recent years, with the digitalization of power systems, Advanced Metering Infrastructure (AMI) and Internet of things (IoT) devices have been widely deployed. Meanwhile, as a huge amount of real-time information about the system and end-user status become available, distributed energy resources aggregation draws increasing attention from both academia and industry. It is expected to facilitate the operation of low-carbon energy systems. Therefore, research on the enhancement of distributed resource aggregation capability has been continuously funded by various national research projects. New principles, technologies, and methods to help enhance distributed resource aggregation capability have emerged, especially positive progress has been made in the following aspects: 1) renewables and distributed energy, 2) low-carbon and energy efficiency, 3) scheduling strategy and optimization.

To present the latest progress and future development trend of distributed energy resources aggregation capacity enhancement and share academic and technical achievements, we organized “Advances in Distributed Energy Resources” to address this hot issue. The call for articles received a great response from scholars in related fields, and many submissions were received. After the editorial team organized an expert review, 13 articles were finally selected for inclusion in this issue. Through this issue, we hope to discuss the latest advances, theoretical results, and future directions of advances in distributed energy resources aggregation for the low carbon future and jointly promote

the research of new principles, new technologies, and new methods of distributed energy resources aggregation, low-carbon and energy efficiency, scheduling strategy and optimization. Brief information on the 13 accpted papers as follows.

1 Renewable and distributed energy

Improving power grid resilience under extreme weather conditions with proper regulation and management on DERs—Experiences learned from Texas power crisis in 2021 by Pan and Li.

Small-Signal Distributed Frequency Modeling and Analysis for Grid-Forming Inverter Based Power System by Qi et al.

Robust Bi-Level Planning Method for Multi-Source System Integrated with Offshore Wind Farms Considering Prediction Error by Jian et al.

Control strategy of distributed energy micro-grid involving distribution system resilience by Wu et al.

2 Low-carbon and energy efficiency

Optimization For Transformer District Operation Considering Carbon Emission And Differentiated Demand Response by Jia et al.

A Low-carbon Dispatch Strategy for Power Systems Considering Flexible Demand Response and Energy Storage by Han et al.

Multi-objective Optimization of Multi-energy Flow Coupling System with Carbon Emission Target Oriented by Zong et al.

Fast and Accurate Traction Induction Machine Performance Calculation Method for Integrated On-board Charging in Vehicle to Grid Application by Cai et al.

3 Scheduling strategy and optimization

An optimal scheduling strategy for integrated energy systems using demand response by Lin et al.

Multi-agent schedule optimization method for regional energy internet considering the improved tiered reward and punishment carbon trading model by Li et al.

Day-ahead operation of an urban energy system considering traffic flows and peak shaving by Peng et al.

Optimal capacity allocation model for integrated energy microgrid considered aggregation of prosumers under multi-market mechanisms by Wang et al.

Unified Active and Reactive Power Coordinated Optimization for Unbalanced Distribution Network in Radial and Looped Topology by Zeng et al.

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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We sincerely thank the authors and readers for their great support of this topic, and especially the editorial board of Frontiers in Energy Research and the reviewers for their efforts to make this topic published successfully. We hope this topic can provide a reference for experts and scholars interested in and engaged in related research to promote the development of original innovation and key technology practice of distributed resource aggregation.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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