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Journal of Modern Power Systems and Clean Energy

Power Systems with Increasing Renewable Penetration: Market, Operations, Planning and Regulation

The increasing penetration of renewable energy sources has presented profound challenges and opportunities to the power industry. The inherent variability and uncertainty associated with weather-dependent renewable sources have changed many aspects of power system control, operations and planning. The related electricity market operation and design in many places in the world might need to be revisited to accommodate the large amounts of renewable energy being integrated into the system. Pricing, reserves, transmission expansion and others need to be adapted to meet the renewable energy penetration targets set by various governing entities. For example, the Commission of the European Union set a renewable energy target of at least 32% by 2030. In this emerging context, new players, roles, and businesses are expected to be created. As an example, the rolling outages in California, USA, due to an extreme heatwave question whether the market design currently implemented has provided enough incentive for long-term capacity expansion to satisfy the demand with adequate security margins.

Besides the bulk system-level issues, distributed energy resources (DERs) have emerged on the distribution side of the system to further enhance grid reliability and enable further renewable integration. The characteristics of DERs are vastly different from those of large-scale renewable sources integrated in the transmission system. Appropriate operations, planning and market mechanisms need to be put in place for an effective and economical operation of the system.

The objective of this special issue is to address control, operations, planning, regulation and market topics in systems with high shares of renewable sources. The topics of interest include, but are not limited to:

- Electricity market design (including offering/bidding, pricing, products, reserves, clearing, settlement and others).
- Demand and flexibility analysis, and related costs.
- Assessment, role, siting, and sizing of storage facilities.
- Business models for market agents and related regulatory frameworks.
- Power system expansion planning to achieve high renewable penetration.
- Market equilibrium modeling.
- Stochastic and robust optimization models for operations and planning.
- Distribution-level market design for DER integration (including tariffs, metering, business models and others)
- Impact of new technologies on operations, planning and markets (including electric vehicles, smart meters, PMUs and others)
- Fuel security and generation mix issues

Submission Guidelines

The manuscripts should be submitted at <https://mc03.manuscriptcentral.com/mpce>.

The article templates can be downloaded from

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Important Dates

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