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Editorial

Special Issue on "Modeling, Analysis and Control Processes of New Energy Power Systems"

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1. Introduction

In recent years, global climate change, environmental pollution, and energy shortage have become increasingly serious. Countries all over the world regard the development of new energy, represented by wind power and photovoltaics, as the key to achieving low-carbon and green development. The scale of global new-energy power generation continues to grow, and the high penetration of new energy will inevitably become one of the basic features and development trends in future power systems. New energy units, such as converter-interfaced wind power and photovoltaics, significantly differ from traditional power units in the perspectives of the power generation principle, control strategy, and grid connection mode. The variability of new energy and the high proportion of associated power electronic devices have brought profound challenges to the new energy power system, including the spatial–temporal mismatch between variable power supply and load, and the stability and security of electronic-enabled power systems.

In order to overcome these challenges, some new technologies such as demand response, energy storage, and FACTs (flexible AC transmission systems) devices have been introduced into the power systems to promote the integration of new energy. Facilitating these new technologies requires adapting the modeling, analysis, and control methods to the transformation of new energy power systems.

This Special Issue on 'Modeling, Analysis and Control Processes of New Energy Power System' aims to promote state-of-the-art research in this promising area. Seventeen original articles were recommended for acceptance and publication. These published articles mainly cover original research on the economic planning and operation of new energy power systems, the stability analysis and control of new energy power systems, and the modeling of power equipment.

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2. Brief Synopsis of Papers in the Special Issue

Lei et al. [1] established a two-stage majorization configuration model to identify and understand how variable energy affects a hybrid energy storage system in active distribution networks. Chen et al. [2] proposed a two-stage layout method for the met mast based on discrete particle swarm optimization zoning and micro-sitting. This study provided a quantitative planning method for met mast layout in practical projects with improved wind-monitoring accuracy. Yang et al. [3] constructed a framework that is suitable for city regional integrated energy systems to participate in the energy market, and proposed an evaluation index system for low-carbon capabilities in the energy market. Li et al. [4] analyzed the life-cycle cost of synchronous condensers and introduced the blind number theory into the cost calculation model to quantify the impacts of various uncertain pieces of information on the cost of the synchronous condenser projects. Li et al. [5] proposed a multi-energy transaction decision-making strategy for a community-level integrated energy system considering user interaction, and the proposed strategy improved both the profit of the community operator and the value-added benefit of energy users.

Yang et al. [6] presented an optimal day-ahead scheduling model for a multi-renewable energy power system with distributed generations while satisfying flexibility constraints. Yuan et al. [7] proposed a time-of-use pricing strategy for integrated energy suppliers and integrated energy users in the integrated energy systems based on game theory.

Hu et al. [8] studied the transient behavior and stability issues of a direct-drive wind turbine during fault recovery in a DC-link voltage control timescale. Zhu et al. [9] defined the static voltage stability assessment problem as a regression problem and constructed an artificial neural network for online assessment. Fu et al. [10] proposed a double-layer fault diagnosis model for the main bearing of a wind turbine that combines the auxiliary classifier generation adversarial network and the deep residual shrinkage network. Zhang et al. [11] used the virtual vector-based model predictive current control to select the optimal virtual vector and apply it to five-phase induction motors. Liu et al. [12] proposed a predictive commutation failure suppression strategy considering multiple harmonics of commutation voltage considering the distortion characteristics of AC voltage of HVDC systems. Yang et al. [13] considered the transmission loss reduction of the HVDC system and established a multi-order fitting function of transmission loss under joint impacts of line-commutated converter stations, voltage source converter stations, and DC lines.

Chen et al. [14,15] proposed an improved magnetic-noise prediction model of a five-phase induction motor through large-slot opening and pole-slot schemes. Luo et al. [16] used an extended Kalman filter algorithm for the parameter identification of the five-phase squirrel cage induction motor. Finally, Xue et al. [17] established an analytical model of an unequal-pitch linear phase-shifting transformer by combining the distributed magnetic circuit method and the Schwartz–Christopher transformation.

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