Title: AI Applications for Optimization and Control of Smart Grids

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Proposal

Smart grid is a modern power grid with the characteristics of informatization, automation, and interaction, including power generation, transmission, transformation, distribution, power consumption, and dispatching of the power system. It covers all voltage levels and realizes the highly integrated integration of "power flow, information flow and business flow", upon which the perception ability of power grids will be greatly enhanced, and vast data will become the basic characteristics of digitalized power grids. With the advancement of smart grid, the access of large-scale renewable energy and novel equipment, and the power market reform have increased the complexity of the power grid and brought more uncertainty to the power grid. Besides, modern power system has been closely coupled with the information system, natural gas system, and transportation system. The smart grid is based on integrated, high-speed two-way communication networks, and developing towards high integration of big data, Internet of things, and cloud computing in power grid.

Due to the inherent strong randomness and uncertainties characteristics of renewable energy, it is difficult yet crucial to undertake some advanced techniques in smart grid with large-scale renewable energy integration, to ensure the power generation output can be optimized and controlled on demand. Hence, exploitation and implementation of various advanced optimization and control techniques is extremely critical for economic and efficient operation, including frequency regulation, voltage support, converter control, parameter/state identification and estimation, MPPT design, planning and dispatching, power and load forecast, and so on. As the core driving force of the new round of scientific and technological revolution, artificial intelligence (AI) is profoundly changing the world, and AI provides a promising solution for system stability assessment. Therefore, exploitation and application of various advanced AI based techniques to deal with optimization and control of smart grid are extremely critical for economic and efficient operation of the next generation of smart grid.

This Special Issue aims to give an effective contribution to highlight all solutions, methodologies, approaches, tools finalized to collect first-class research along this direction, focusing on the most recent investigations and studies on optimization and control strategies for smart grid. Researchers and experts worldwide are invited to submit high-quality original research papers and review articles on the subsequent potential topics. .

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The themes that can be addressed in the special issue are:

- Modelling and simulation of renewable energy system
- Operation planning and control of energy storage system
- Application of optimization techniques such as meta-heuristic algorithms, reinforcement learning, and neural networks in smart grids
- Control strategies such as fuzzy logic control, sliding-mode control, feedback control, perturbation/disturbance observer based control, H-infinity control, and backstepping control for smart grids

- Approaches for the optimized design of architectures and sizing of smart grids
- Solutions and techniques for energy generation, conversion, distribution, storage, and use (e.g., renewable energy generation, energy storage systems, etc.)