Guest Editorial: Special Issue on Power Quality

An LUO[1]

More and more distributed generations (DGs) such as solar, wind, and energy storage, etc, inject into the power grid mainly through the power electronics equipments. Large-scale power electronic equipments connected to the grid bring new challenges for traditional power quality. Power quality analysis theory and control technology for smart grid will provide the comprehensive and systematic solutions and approaches in the application of DGs. This special issue is dedicated to reflecting the latest progress and technologies in power quality.

Firstly, An LUO, Qianming XU, Fujun MA et al review an overview of power quality analysis, detection, and control technologies for smart grid, and show the trends and prospects of power quality control technology. The rest of other 14 papers included focus on the following 3 topics.

1) Power quality analysis, detection and estimation

Yubo YUAN, Peng LI et al propose the theoretical calculation method and spectra of the output voltage harmonics of modular multilevel converter (MMC), and analyze the harmonic influence of unified power flow controller based on MMC on the grid. Peng LI, Jing GAO, Duo XU et al present an improved HHT with adaptive waveform matching extension in power quality disturbance detection of microgrid. Ruiqi LI, Hua GENG, and Geng YANG study characteristics of practical asymmetrical voltage swell during voltage recovery in the renewable energy conversion system (RECS), and propose an asymmetrical high-voltage ride-through (HVRT) control strategy with a chopper circuit for RECS to ride through the entire fault recovery process and mitigate the fluctuations. Raghavendra P and D. N. GAONKAR present a methodology for the estimation of voltage profile in smart distribution network with DGs, and for the online voltage control under the different line ratios and laterals. Tianyuan TAN, Wenjuan CHEN, Kaipei LIU et al present an approach of harmonic analysis based on time domain mutual-multiplication window to suppress frequency spectral leakage.

2) Active control of power quality

Konstantinos O. OUREILIDIS, Emmanouil A. BAKIRTZIS et al propose a frequency-based control strategy for islanded microgrid with renewable energy sources and energy storage, where the frequency of the microgrid common AC bus is determined by the energy storage converter. Zhiyong CHEN, Yandong CHEN et al present an equivalent coupling circuit modeling of multi-parallel inverters in microgrid operating in grid-connected mode. Resonance peaks with the growth in the number of inverters are obtained. An active damping parameter design method is proposed to attenuate coupling resonance. Zhikang SHUAI, Shanglin MO et al present a robust droop control strategy based on the signal detection of the high-voltage side for high-voltage microgrid to realize the loads sharing and voltage regulation. Xiaoqiang GUO and Josep M. GUERRERO present a unique abc-frame complex-coefficient filter and controller for the three-phase grid-connected inverter

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in order to eliminate current harmonic and compensate three-phase unbalance. Hongtao SHI, Fang ZHUO, Hao YI et al propose a unified three-phase voltage correction strategy (UTVCS) based on negative-sequence compensation for microgrid under three-phase unbalance condition, which can be realized simply and enhanced power quality of microgrid. Tao XU, Ran WEI et al propose a global synchronous discontinuous pulse width modulation (GSDPWM) method for three-phase inverter to attenuate the high frequency harmonic current.

3) Passive control of power quality

Yunfei XU, Xiangning XIAO et al present a voltage compensation strategy based on simultaneous reactive power injection (SRI) of unified power quality conditioner (UPQC-SRI) with consideration of the minimum current capacity and the minimum injection current, which solves voltage sag and has an even larger compensation region of zero active power injection. Jiaxin YUAN, Yongheng ZHONG et al propose an electromagnetic hybrid compensation system (EHCS) and control strategy to compensate huge capacity negative sequence current generated by high-speed railway load, where the constraint optimization compensation method on the condition of meeting the national standard is proposed to reduce compensation capacity further. Fangang MENG, Lei GAO et al compares the two 12-pulse rectifier using the delta- and wye-connected autotransformer from the input line current and load voltage, capacity rating under the same output power.

In summary, these 15 papers are well organized to address various challenging and solution issues in power quality. This issue is dedicated to address an introduction of power quality analysis and control methods for smart grid mainly including microgrid, distributed power station, and DGs.

We would like to express heartfelt thanks to all authors for contributing their original ideas and innovative works in this special issue, and also thank all reviewers for their on-time paper reviewing greatly improving the paper quality. We also like to express our thanks to the Editors-in-Chief, Prof. Yusheng XUE, Prof. Kit Po WONG for their kind guidance and supports. Finally, we would like to thank the handling editors of MPCE for their work enthusiasm and continual support during the whole process.

Guest Editors-in-Chief

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