

Guest Editorial: Special Issue on Active Distribution Systems

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The increasing penetration of intermittent and stochastic distributed energy resources (DERs), including renewable generations, active loads and energy storage, brings great challenges for traditional distribution networks. Active distribution systems (ADS) have coordinated controls and active managements in place and make the higher penetration and integration of distributed energy resources possible. This special issue is dedicated to reflecting the latest progress and technologies in ADS. There are 17 papers included focusing on the following 7 topics.

1) Planning

Junyong LIU, Hongjun GAO, Zhao MA et al review the ADS planning and introduce some directions for future research including planning collaboratively with all elements combined in ADS, taking into account of joint planning in secondary systems, etc. Shaoyun GE, Shiju WANG et al discuss a substation planning method for active distribution network, in which a low-carbon evaluation objective function is added to the substation planning model to evaluate the contribution of distributed generators (DGs) to a low-carbon economy. Neeraj KANWAR, Nikhil GUPTA, et al present an optimal DG allocation method in radial distribution systems considering customer-wise dedicated feeders and load patterns with objectives to maximize annual energy loss reduction and to maintain a better node voltage profile. Xinwei SHEN, Yingduo HAN, Shouzhen ZHU et al present a comprehensive

power-supply planning method of active distribution network considering cooling, heating and power load balance, in which its model offers the integration of balance on electric power, cooling and heating load, respectively.

2) Control and protection

Jiaming WENG, Dong LIU et al propose a fault location, isolation and service restoration method for active distribution network based on distributed processing, using the differential-activated algorithm based on synchronous sampling for feeder fault location and isolation. Emilio GHIANI and Fabrizio PILO investigate the use of smart inverter in a critical PV installation, where relevant voltage fluctuations exist, and present a smart inverter operation in distribution networks with high penetration of photovoltaic systems. Benjamin MILLAR, Danchi JIANG et al propose a constrained coordinated distributed control method for smart grid based on asynchronous information exchange. Yuwei SHANG, Shenxing SHI et al propose an islanding detection method based on asymmetric tripping of feeder circuit breaker in ungrounded power distribution systems.

3) Management

Yue XIANG, Junyong LIU et al present an active energy management strategy for ADS based on benefit model considering the operational constraints of the distribution system, as well as plug-in electric vehicles (PEVs) with flexible charging/discharging schedules. Jun XIAO, Qibo HE et al present a distribution management system (DMS) framework based on security region in low carbon distribution systems situation, in which security region is capable to describe the $N-1$ security boundary of the whole distribution

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network, including the secure output range of DGs. Meysam GHOLAMI, Jamal MOSHTAGH et al present a service restoration in distribution networks using a combination of two heuristic methods considering load shedding.

4) System analysis and market

Yao JIN, Zhengyu WANG et al propose a dispatch and bidding strategy of active distribution network in energy and ancillary services market using a bi-level coordinate dispatch model with fully consideration of the information interaction between main grid and ADN. Jinquan ZHAO, Xiaolong FAN et al propose a distributed continuation power flow method for integrated transmission and active distribution grid, in which two different parameterization schemes are adopted to guarantee the coherence of load growth in transmission and distribution grids.

5) Energy storage

Jiongcong CHEN and Xudong SONG present the economy of energy storage technology in active distribution network focusing on the combination of energy storage systems and intermittent energy systems in some specific situations of the grid integrated with wind power. Yu ZHENG, Zhaoyang DONG et al discuss an optimal integration method of mobile battery energy storage in distribution system with renewables, in which the optimization is formulated as a bi-objective problem, considering the reliability improvement and energy transaction saving, simultaneously.

6) Power quality

Guangqian DING, Ran WEI et al investigate a communication-less harmonic compensation method in a multi-bus microgrid through autonomous control of distributed generation grid-interfacing converters, in which the control approach of each individual DG unit was designed to use only feedback variables of the converter itself that can be locally measured.

7) Communication

Theodoros A. TSIFTISIS, Paschalis C. SOFOTASIOS et al present a deployment method of wireless sensor

network in dispersed renewable energy sources for distribution network, with the aid of the outage probability criterion in the context of cooperative communications, in which it allows the involved components to communicate with each other by means of a robust and flexible wireless sensor network architecture.

In summary, these 17 papers are well organized to address various challenging issues in ADS. It is hoped that this issue will serve as an introduction for future research aimed at the interconnection of DERs to distribution network. We would like to take this opportunity to thank all authors for contributing their new ideas and original researches to this special issue, and all reviewers for their on-time paper reviewing which helped us greatly in the paper selection process and the overall quality improvement. We also like to express our gratitude to the Editors-in-Chief, Prof. Yusheng XUE, Prof. Kit Po WONG and the handling editors of MPCE for their work enthusiasm and sharp awareness of the cutting-edge technology to initiate this special issue and offer continual support.

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