IEEE Transactions on Energy Conversion

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Analysis and Control for Grid-Forming Renewable Power Generation

Theme: Driven by worldwide targets of carbon emissions reduction in the last few decades, large amounts of non-fossil-fuel electric power generating apparatus have been integrated into the grid using power electronics converters (PECs). Accordingly, these renewable power generation units (RPGs) are expected to provide grid support services matching their increasing proportion. Compared with the mature and widely used grid-following (GFL) control strategy for PECs, the grid-forming (GFM) control strategy enables PECs to actively support the external grid, which has aroused wide attention in recent years. However, the energy to realize the grid support service comes from the primary power unit rather than the converter itself, thus the energy conversion process dynamics or physical constraints have a significant impact on the external characteristics of GFM-based sources. Hence, there are two aspects of special interest. First, coupling mechanisms between the energy conversion process and GFM control dynamics for different energy sources (e.g., mechanical, chemical, and solar) need to be identified and understood better, to mitigate complex interactions between power sources and potential stability problems. Second, it is important to design advanced GFM control strategies considering the energy conversion process dynamics to provide the desired grid services (frequency and voltage support, black-start, stability enhancement, ride-through, etc.). The main objective of this special issue is to seek publications that highlight recent advances and breakthroughs in modeling and advanced strategies for GFM control considering energy conversion process dynamics, ranging from components of a single converter to converter clusters. The topics of interest include, but are not limited to:

- Analysis on energy flow and mechanical/electromagnetic stress for GFM-RPG considering various energy conversion dynamics
- Characteristics and modelling of GFM-RPG for grid frequency and voltage dynamic analysis
- Advanced GFM control strategies for grid integration, such as inertial control, primary/secondary control, and fault-ride-through control
- Hybrid operation with GFM- and GFL-RPG within the bulk power system or an isolated micro grid
- Stability analysis and enhancement for GFM-RPG, such as small- and large-signal stability
- Application scenarios and technology requirements of GFM technology, such as power quality improvement, suppression of transient overvoltage, frequency and voltage dynamic support, and black-start
- Standards for GFM technology application

Manuscript Preparation and Submission

Prior to preparing a full paper, please prepare a 500 - 1000 word Extended Abstract. Please submit your Extended Abstract in electronic form via email to the Guest Editor-In-Chief, Prof. Jiabing Hu (j.hu@hust.edu.cn). Please always put "IEEE TEC Special Issue on Analysis and Control for Grid-Forming Renewable Power Generation" in the subject line in all your correspondence. The team of Guest Editors will evaluate the submitted abstracts for appropriateness and timeliness. Based on scope and suitability for this special issue, the authors will be invited to submit full papers, which will then undergo a peer review process. The Full Manuscripts will be submitted in electronic form through the Manuscript Central web site: http://mc.manuscriptcentral.com/tec-pes. On the submitting page #1 in popup menu of manuscript type, select: Special Section: Analysis and Control for Grid-Forming Renewable Power Generation.

Editor-in-Chief: **Dionysios Aliprantis**
dionysis@purdue.edu Tel: +1 765 494-4434
School of Electrical and Computer Engineering, Purdue University, 465 Northwestern Ave, IN 47907-2035, USA

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Timetable

Deadline for submission of abstracts	December 31, 2023
Invitation for full paper submissions	January 31, 2024
Deadline for submission of full manuscripts	March 31, 2024
End of 1st review cycle and notification to authors	June 30, 2024
Deadline for submission of revised manuscripts	August 31, 2024
End of 2nd review cycle and final decision	October 31, 2024
Publication materials due	November 15, 2024
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Dionysios C. Aliprantis, School of Electrical and Computer Engineering, Purdue University, USA

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Yingbiao Li, Huazhong University of Science and Technology, China, liyb@hust.edu.cn
Jason Macdowell, GE Gas Power, USA, jason.macdowell@ge.com
Lei Shang, Wuhan University, China, shanglei@whu.edu.cn
Huanhai Xin, Zhejiang University, China, xinhh@zju.edu.cn