

Guest Editorial: Special Issue on Advanced Charging Technologies for Next-Generation Electric Vehicles

TO EMBRACE a carbon neutrality future, we are witnessing the paradigm shift from internal combustion engine vehicles to electrified vehicles. The mainstream electric vehicles (EVs) are equipped with a high-voltage battery pack. Charging infrastructure plays a pivotal role in the era of electrified transportation. Its power determines the speed and convenience of recharging, its energy efficiency directly affects the mileage cost of EVs, and its performance impacts the lifespan of the battery. In addition, vehicle-to-grid (V2G) technology requires chargers to have bidirectional power transfer capabilities. This Special Issue aims to provide the latest solutions for the advanced charging of next-generation EVs. The system includes the onboard charger, offboard charging pile, wireless charging, fast charging and charging scheduling, etc. Key emerging research areas covered include innovative power conversion topologies, modeling techniques, control strategies, and energy management algorithms. These advancements are characterized by enhanced features, such as greater intelligence, higher efficiency, increased power density, improved thermal management, extended lifespan, and reduced costs.

This Special Issue aims to provide a platform for researchers from both academic and industrial sessions to report their recent results and overlook emerging research directions in advanced power conversion for next-generation EVs. The call for a paper in the Special Issue on Advanced Charging Technologies for Next-Generation EVs of the IEEE JOURNAL OF EMERGING AND SELECTED TOPICS IN POWER ELECTRONICS (JESTPE) was released in December 2022. We received 82 submissions in total. Reviews were promptly organized by guest associate editors both in academia and industry from the United States, Canada, New Zealand, France, Denmark, Japan, South Korea, and China. Reviewers are invited from all over the globe. After rigorous reviews, 29 articles were finally selected for publication. These accepted papers address different challenges with innovative solutions from different perspectives of charging technologies. While many articles address multiple aspects together, the articles can be broadly categorized as follows. Review articles for charging technologies, ac/dc power conversion for EV charging, intelligent charging strategies, control and optimization

strategies, optimization of dual active bridge (DAB) converters, magnetic integration, advanced modeling technologies, dc/dc topologies for EV charging, and dynamic wireless charging.

We appreciate the efforts from all authors who had submitted papers and we appreciate timely reviews from guest associate editors and reviewers, who have voluntarily provided constructive and timely feedback. Great thanks to all guest associate editors for their diligence and professional support to this Special Issue.

- 1) Sheldon Williamson, Ontario Tech University, Oshawa, ON, Canada.
- 2) Hiroo Sekiya, Chiba University, Chiba, Japan.
- 3) Duleepa Thrimawithana, University of Auckland, Auckland, New Zealand.
- 4) Lijun Hang, Hangzhou Dianzi University, Hangzhou, China.
- 5) Ayan Mallik, Arizona State University, Mesa, AZ, USA.
- 6) Hongjie Wang, Utah State University, Logan, UT, USA.
- 7) Sewan Choi, Seoul National University of Science and Technology, Seoul, South Korea.
- 8) Fei Gao, University of Technology of Belfort-Montbéliard (UTBM), Belfort, France.
- 9) Hao Chen, Tesla Motors, Fremont, CA, USA.
- 10) Josep M. Guerrero, Aalborg University, Aalborg, Denmark.
- 11) Dorai Babu Yelaverthi, ABB, Raleigh, NC, USA.

We would like to express our deep gratefulness to Prof. Tsorng-Juu (Peter) Liang, Editor-in-Chief, for his tremendous support from the initiative throughout the final stages of this Special Issue. Finally, we would like to thank Jessica Uherek, JESTPE Administrator for her professional assistance throughout the production process. We look forward to seeing more great papers on Advanced EV Charging Technologies in IEEE JOURNAL OF EMERGING AND SELECTED TOPICS IN POWER ELECTRONICS in the time yet to come and to yours continuous support of the journal.

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In September 2014, he joined the School of Information Science and Technology, ShanghaiTech University, Shanghai, China, where he is currently an Associate Professor with tenure. In 2023, he visited the University of Cambridge, Cambridge, U.K., as a Visiting Academic Fellow. His research interests include power electronics, pulsed power supply, plug-in electric vehicles, and renewable energy systems.

Dr. Wang is an Associate Editor of *IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS*, *IEEE TRANSACTIONS ON TRANSPORTATION ELECTRIFICATION*, and *CPSS Transactions on Power Electronics and Applications*. He is also a Guest Editor of *IEEE JOURNAL OF EMERGING AND SELECTED TOPICS IN POWER ELECTRONICS*.



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Dr. Mi is a fellow of the Society of Automotive Engineers (SAE). He was a recipient of the IEEE Power Electronics Society (PELS) Emerging Technology Award in 2019, the IEEE

TRANSACTIONS ON POWER ELECTRONICS Best Paper Award, and two *IEEE TRANSACTIONS ON POWER ELECTRONICS* Prize Letter awards. He was a recipient of the Albert W. Johnson Lecture Award, which is the highest distinction for any SDSU faculty.



Shu-Yuen Ron Hui (Fellow, IEEE) received the B.Sc. degree (Eng. Hons.) in electrical and electronic engineering from the University of Birmingham, Birmingham, U.K., in 1984, and the D.I.C. and Ph.D. degrees in electrical engineering from Imperial College London, London, U.K., in 1987.

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Dr. Hui is a fellow of the Australian Academy of Technological Sciences and Engineering, the U.S. National Academy of Inventors, and the Royal Academy of Engineering, U.K. His inventions on wireless charging platform technology underpin key dimensions of Qi, the world's first wireless power standard, with freedom of positioning and localized charging features for wireless charging of consumer electronics. He also developed the photo-electro-thermal theory for light emitting diode (LED) systems and electric spring technology for smart grids. He was a recipient of the IEEE Rudolf Chope Research and Development Award, the IET Achievement Medal (The Crompton Medal) in 2010, and the IEEE William E. Newell Power Electronics Award in 2015.