Tutorial SESSION

Tutorial Session on "DC Power Packet Dispatching System for Internet of Energy (IoE)"

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ORGANIZED by

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TUTORIAL SESSION DESCRIPTION

The rapid development of Internet of Things (IoT) has enabled the Internet of Energy (IoE), which integrates information and power to optimize both energy efficiency and power conversion efficiency of the distributed energy systems. The most straightforward approach to adopting IoE is to add an information layer to the controllers of different power equipment and coordinate the power flow at the expense of additional cost of communication system. An alternative solution is the power-line carrier (PLC) communication technique which can transfer power and information flow simultaneously through the same transmission line. However, traditional PLC technology is not designed to realize time-division and multi-path transmission of power flows. Power packet dispatching system (PPDS) is recently introduced to provide such capabilities for PLC technology. In this tutorial, a review of existing PLC technologies is first explained. The DC PPDS is then introduced along with design considerations of the building blocks such as the energy router and energy mixer. An over-current protection scheme to improve system reliability is given. Several power converter topologies and maximum power point tracking algorithms are explained to demonstrate how energy and power conversion efficiencies can be improved.

WHAT IS COVERED

- Comparative study of existing power and information integrated technologies
- Overview of DC power packet dispatching system (PPDS)
- Design of energy router and energy mixer
- Over-current protection of DC PPDS
- Optimisation of both energy and power conversion efficiencies

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SHORT BIO OF ORGANIZERS

Dr Dylan Dah-Chuan Lu received his Ph.D. degree in electronic and information engineering in 2004, from the Hong Kong Polytechnic University, Hong Kong. In 2003, he joined PowereLab Ltd. as a Senior Design Engineer where he was responsible for industrial switching power supply projects. He was a full-time faculty member with The University of Sydney from 2006 to 2016, where he now holds an Honorary position. Since July 2016, he has been an Associate Professor at the School of Electrical and Data Engineering, University of Technology Sydney, Australia. At present he is the Head of Discipline of Electrical Power and Energy Systems in the School. He has authored and co-authored more than 100 international journals and held 2 patents in power electronics. He has completed more than 20 government, university and industry funded projects in this field. His current research interest includes efficient and reliable power conversion for renewable sources, energy storage systems, and microgrids. He is presently serving as a Chair of Joint Chapter IAS/IES/PELS for IEEE NSW Section and an Associate Editor of the *IEEE Transactions on Industrial Electronics*.

Dr C.M.F.S. Reza received his Ph.D. degree in electrical and information engineering from the University of Sydney, Australia, in 2019. He has completed his B.S. degree in electrical and electronic engineering from Chittagong University of Engineering and Technology (CUET), Bangladesh, in 2010, and the M.S. degree in electrical engineering from University of Malaya, Malaysia, in 2014. From November 2011 to October 2014, he was a Research Assistant at the Power Electronics & Renewable Energy Research Laboratory (PEARL), University of Malaya, Malaysia. He is currently working as a Senior Research Assistant at the School of Electrical and Data Engineering, University of Technology Sydney, Australia. He has authored and co-authored several international journals and conferences. His research interests include design, analysis, and control of power electronic converters for renewable energy systems, control algorithm, and system modeling for efficient power packet distribution system.

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