Tutorial at PESA 2020, Hong Kong, China

Title:

Recent Advances in Small-Signal Modeling of Power Converters and Distributed Power Systems

Abstract:

Small-signal modeling is very important to the analysis and control design of electric energy systems. As electric energy systems enter into a new era, they have been experiencing many changes towards future, among which turning into more electronic, i.e. integrating more and more electronic power converters, and incorporating more and more distributed generations are the two major ones. The technical challenges to the small-signal modeling of electric energy systems due to these changes will be discussed in this tutorial, from the view point of the need of both theoretical insights and engineering practices Some of the recent advances in the researches of small-signal modeling will then be illustrated in more details for both single power converters, such as basic DC-DC converters and 3-phase AC-DC converters, as well as distributed power systems, which are composed of a group of power converters connected in either a DC or AC bus and interfacing either energy sources or energy users. Whether, how and in what capacity these newly achieved results have responded to the challenges will be elaborated and commented respectively. The specific issues that the speaker believes are still lacking effective engineering solutions and hopefully would attract more attentions will be identified too.

Biography of the speaker



**Jinjun Liu** received a B.S. degree in industrial automation and a Ph.D. degree in electrical engineering from Xi’an Jiaotong University (XJTU), Xi’an, China, in 1992 and 1997, respectively.

He then joined the XJTU Electrical Engineering School as a faculty. From late 1999 to early 2002, he was with the Center for Power Electronics Systems, Virginia Polytechnic Institute and State University, USA, as a Visiting Scholar. In late 2002, he was promoted to a Full Professor and then the Head of the Power Electronics and Renewable Energy Center at XJTU, which now comprises 21 faculty members and over 150 graduate students and carries one of the leading power electronics programs in China. From 2005 to early 2010, he served as an Associate Dean of Electrical Engineering School at XJTU, and from 2009 to early 2015, the Dean for Undergraduate Education of XJTU. He is currently a XJTU Distinguished Professor of Power Electronics. He coauthored 3 books (including one textbook), published over 400 technical papers in peer-reviewed journals and conference proceedings, holds over 50 invention patents (China/US/Europe), and delivered for many times plenary keynote speeches and tutorials at IEEE conferences or China national conferences in power electronics area. His research interests include modeling, control, and design methods for power converters and electronified power systems, power quality control and utility applications of power electronics, and micro-grids for sustainable energy and distributed generation.

Dr. Liu received for eight times governmental awards at national level or provincial/ministerial level for scientific research/teaching achievements. He also received the 2006 Delta Scholar Award, the 2014 Chang Jiang Scholar Award, the 2014 Outstanding Sci-Tech Worker of the Nation Award, the 2016 State Council Special Subsidy Award, and the IEEE Transactions on Power Electronics 2016 Prize Paper Award. He served for the IEEE Power Electronics Society as 2015-2019 Executive Vice President and 2020-2021 Vice President for membership, and was elevated to IEEE Fellow in 2018. He is on the Board of China Electrotechnical Society (CES) and a member of DC Transmission and Power Electronics Committee of Chinese Society for Electrical Engineering (CSEE), and was elected the Vice President in 2013 and the Secretary General in 2018 of the CES Power Electronics Society. Since 2013, he has been the Vice President for International Affairs, China Power Supply Society (CPSS) and since 2016, the inaugural Editor-in-Chief of *CPSS Transactions on Power Electronics and Applications*. Since 2013, he has been serving as the Vice Chair of the Chinese National Steering Committee for College Electric Power Engineering Programs.