

1. Session Title

Standard development for solid state transformer: an update on existing IEEE standards on magnetics and new standard for solid state transformer

2. Abstract

Solid state transformer is an emerging technology that replaces the traditional line frequency transformer with additional functions and intelligence. It has gained significant attention in the past 10 years. This is evident that number of publications in IEEE alone has increased by more than 25x from 2010 to 2020. Around the world, there are many on-going demonstration projects for different applications, such as smart grid integration, EV fast charger, wind and solar power conversion, etc. However, there is no standard available as to what is the recommended practice in designing such a device and how to integrate it into electric grid. To fill this gap, IEEE Power electronics society (PELS) has launched the new standard development (P3105) on this particular topic. Also within the PELS, the Electronic transformers technical committee is the driven force that develops various standards for the magnetic components. The proposed special session brings the experts from both P3105 and ETTC working groups, together with some key industry players in SST area, to discuss this new development effort as well as gaps and challenges.

3. Session Organizers

Organizer 1: Prof. Marco Liserre, Professor, Kiel University, Germany



Marco Liserre received the MSc and PhD degree in Electrical Engineering from the Bari Polytechnic, respectively in 1998 and 2002. He has been Associate Professor at Bari Polytechnic and from 2012 Professor in reliable power electronics at Aalborg University (Denmark). From 2013 he is Full Professor and he holds the Chair of Power Electronics at Kiel University (Germany). He has published 500 technical papers and a book. These works have received more than 35000 citations. Marco Liserre is listed in ISI Thomson report "The world's most influential scientific minds" from 2014. He has been awarded with an ERC Consolidator Grant for the project "The Highly Efficient And Reliable smart Transformer (HEART), a new Heart for the Electric Distribution System". He is member of IAS, PELS, PES and IES. He has been serving all these societies in different capacities. He has received the IES 2009 Early Career Award, the IES 2011 Anthony J. Hornfeck Service Award, the 2014 Dr. Bimal Bose Energy Systems Award, the 2011 Industrial Electronics Magazine best paper award and the Third Prize paper award by the Industrial Power Converter Committee at ECCE 2012, 2012, 2017 IEEE PELS Sustainable Energy Systems Technical Achievement Award and the 2018 IEEE-IES Mittelman Achievement Award. He is currently serving as chair of IEEE P3105 working group.

Organizer 2: Prof. Johan Enslin, Professor, Clemson University, US



Johan H Enslin is the Duke Energy Endowed Chaired Professor at Clemson University in North Charleston SC and Executive Director for the Energy Systems Program at the Zucker Family Graduate Education Center. He has combined a balanced industry and academic career with 40-year leadership experience in industry and academia throughout the USA, Europe and South Africa. Dr. Enslin's current research focuses mainly in the area of building a smarter, modern integrated AC & DC power grid with high penetration of converter-based generation. Among others he is evaluating the role and optimization of energy storage technologies in grid modernization initiatives, hybrid AC & DC power grids and Virtual Power Plants (VPPs). He is a registered Professional Engineer in

South Africa, Fellow of the SAIEE and Fellow of the IEEE. He is currently serving as VP of Industry and Standards and AdCom member for the IEEE PELS Society.

Organizer 3: Dr. Xu She, Director of Engineering, Lunar energy, US



Xu She received the B.Sc. degree in electrical engineering, the B.A. degree in English, and the M.Sc. degree in electrical engineering from the Huazhong University of Science and Technology, Wuhan, China, in 2007 and 2009, respectively, and the Ph.D. degree in electrical engineering from North Carolina State University, Raleigh, NC, USA, in 2013. From 2013 to 2022, he held multiple progressive leadership roles with both GE and Carrier corporation. Now he is director of engineering at Lunar energy. His research interests include emerging power electronics technologies, renewable energy systems, and microgrids. He has more than 70 papers and 40 patent families to his credit in these areas. Dr. She was the recipient a few prestigious awards from industry and IEEE, including the 2017 IEEE Industry Application Society Andrew W. Smith Outstanding Young Member Achievement Award, 2018 GE Whitney Technical Achievement Award, 2021 IEEE Region 1 Industry Technological Innovation award, and 2022 IEEE Rodulf and Chope Research & Development Award. He is currently serving as vice chair of IEEE PELS standard committee and vice chair of P3105 working group.

Organizer 4: Matt Wikowski, Vice president of magnetic technology and product development, Enachip, US



Matt Wikowski is the vice president of magnetics technology and product development for EnaChip. Matt has a MSEE from Lehigh University (1991) and a BEEE degree from Steven's Institute of technology (1979). Matty has been involved with the integration of magnetics into power delivery systems and devices for more than forty years. Matt is a past chairperson of the ETTC and IEC TC51. He is currently the chairperson of the ETTC working groups for Test for Magnetic Cores and Near Magnetic Field Characterization. He is a Fellow of IEEE and the recipient of 2022 IEEE Award for Achievement in Power Electronics Standards. He is currently serving as chair of IEEE PELS standard committee.

Organizer 5: Prof. Zhixiang Zou, Southeast University, China



Zhixiang Zou received the B.Eng. and Ph.D. degrees in electrical and engineering from Southeast University, Nanjing, China, in 2007 and 2014, respectively, and the Dr.-Ing. degree (summa cum laude) from Kiel University, Kiel, Germany, in 2019. From 2007 to 2009, he was an Engineer with State Grid Electric Power Research Institute, Nanjing, China. From 2014 to 2019, he was a Research Fellow and Lecturer with the Chair of Power Electronics, Kiel University. He is currently an Associate Professor with the School of Electrical Engineering, Southeast University. His research interests include smart transformers, microgrid stability, modeling and control of power converters. Dr. Zou is an Associate Editor for the IEEE Open Journal of Power Electronics, an Associate Editor for the IEEE Access, the Editor of the International Transactions on Electrical Energy Systems, and the Editor of the Mathematical Problems in Engineering, and the Standing Director of the IEEE PES Power System Relaying & Control Satellite Committee. He is currently serving as secretary of IEEE P3105 working group.

4. Session Panelists/Speakers

Panelist 1: George Slam, Senior Applications and Content Engineer Wurth Elektronik, Chairperson ETTC

Title: ETTC update: Bridging the technology gaps for magnetics through standards.

Panelist 2: Paul Ohodnicki, Associate Professor, University of Pittsburgh

Title: Segway from magnetic core loss characterization on standard specifications for high power transformers and inductors

Panelist 3: Rudy Wang, Senior member of technical staff, Delta Electronics

Title: Solid state transformer for medium voltage applications

Panelist 4: Vijay Bhavaraju, Principal engineer, Eaton Corporation

Title: Standardization requirements for SST for EV charging

Panelist 5: Jung-Ik Ha, Professor, Seoul National University, Korea

Title: Standard and Considerations for Capacitively Coupled solid state transformer

Panelist 6: Alex Q. Huang, Chair professor, University of Texas Austin

Title: Medium Voltage Solid State Transformer Enabled DC Microgrid