

Special Session on
**“IMPEDANCE SOURCE CONVERTERS: TOPOLOGIES,
CONTROL AND APPLICATIONS”**

Organized by

Hamed Mashinchi Maheri (TalTech, Estonia/ University of Tabriz, Iran)
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Iran), Sertac Bayhan (Hamad Bin Khalifa University, Qatar), Minh-Khai
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Call for Papers

Research in the field of Impedance Source Converters was initiated in 2002 by the invention of the Z-Source inverter. Z-Source inverters are able to provide buck-boost functionality by the single switching stage and improved reliability due to the inherent short-circuit immunity. These advantages urge active research in the field of Impedance Source Inverters. The impedance source technology was applied to all four basic converter types: DC-AC, DC-DC, AC-AC, and AC-DC. Impedance source converters are applied in a very broad area: from modern energy generation systems (renewable and alternative) to DC circuit breakers and electronic loads. To promote further research and development of impedance source converters and to provide a common environment for presentation and discussion on their emerging research, development, and applications, we propose a special session on the impedance source converter topologies and their applications.

Topics of interest include, but are not limited, to the following:

- New topologies of impedance source networks
- Multilevel and multiphase impedance source converters
- Impedance source DC-DC converters
- Impedance source DC-AC, AC-DC converters
- Impedance source matrix converters
- Control strategies of impedance source converters
- Design considerations for power and control stages

- Loss analysis and losses minimization methods
- Reliability issues
- Review and challenges on impedance source converters
- Applications of impedance source converters in electric drives
- Applications of impedance source converters in renewable energy and grid connected systems, such as in:
 - a. Photovoltaic systems
 - b. Fuel cell systems
 - c. Wind turbine systems
 - d. Energy storage systems
 - e. Hybrid systems

▪ **IES Technical Committee Sponsoring the Special Session (if any):**

Power Electronics Technical Committee: Inverters/Rectifiers subcommittee, Impedance Source Converters subcommittee, Electric Machines and Drives subcommittee

▪ **Brief CV of SS Organizers (photo, name, email, and short CV)**

Organizer 1: **Hamed Mashinchi Maheri**, hamed.mashinchi@taltech.ee (IEEE M 92795785), Postdoctoral researcher, TalTech University, Tallinn, Estonia (Corresponding organizer).



Hamed Mashinchi Maheri (S'15, M'20) was born in Tabriz, Iran, in 1984. He received the B.S. degree in Electrical Engineering from the Department of Engineering, Islamic Azad University of Ardabil, Ardabil, Iran, in 2008 and the M.S. degree from the Department of Engineering, Islamic Azad University of Ahar, Ahar, Iran, in 2011. He received the Ph.D. degree in Electrical Engineering from the Department of Electrical and Computer Engineering, University of Tabriz, in 2017. He has been a Postdoctoral Research Fellow with power electronic group of Tallinn University of Technology (TalTech), Estonia since January 2020. His major fields of interest include the analysis, control, and modeling of power electronic converters.

Organizer 2: **Dmitri Vinnikov**, dmitri.vinnikov@taltech.ee (IEEE SM 90246358), Research Professor, TalTech University, Tallinn, Estonia (Corresponding organizer).



Dmitri Vinnikov (M'07, SM'11) received the Dipl.Eng., M.Sc., and Dr.Sc.techn. degrees in electrical engineering from Tallinn University of Technology, Tallinn, Estonia, in 1999, 2001, and 2005, respectively. He is currently the Head of the Power Electronics Group, Department of Electrical Power Engineering and Mechatronics, TalTech (Estonia) and a Guest Researcher at the Institute of Industrial Electronics and Electrical Engineering, Riga Technical University (Latvia). He is the Head of R&D and co-founder of Ubik Solutions LLC - Estonian start-up company dedicated to innovative & smart power electronics for

renewable energy systems. Moreover, he is one of the founders and leading researchers of ZEBE – Estonian Centre of Excellence for zero energy and resource efficient smart buildings and districts. He has authored or coauthored two books, five monographs and one book chapter as well as more than 200 published papers on power converter design and development and is the holder of numerous patents and utility models in this field. His research interests include applied design of power electronic converters and control systems, renewable energy conversion systems (photovoltaic and wind), impedance-source power converters, and implementation of wide bandgap power semiconductors.

Organizer 3: Ebrahim Babaei, e-babaei@tabrizu.ac.ir (IEEE SM 90746876), Professor, University of Tabriz, Tabriz, Iran.



Ebrahim Babaei (M'10, SM'16) received the Ph.D. degree in Electrical Engineering from University of Tabriz, in 2007. In 2007, he joined the Faculty of Electrical and Computer Engineering, University of Tabriz. He has been Professor since 2015. He is the author and co-author of more than 460 journal and conference papers. He also holds 24 patents in the area of power electronics. His current research interests include the analysis, modelling, design, and control of Power Electronic Converters and their applications, Renewable Energy Sources, and FACTS Devices.

Prof. Babaei has been the Editor-in-Chief of the Journal of Electrical Engineering of the University of Tabriz, since 2013. He is also currently an Associate Editor of the IEEE Transactions on Industrial Electronics and IEEE Transactions on Power Electronics. He has been the Corresponding Guest Editor for different special issues in the IEEE Transactions on Industrial Electronics. In addition, Prof. Babaei has been the Track Chair, organizer of different special sessions and Technical Committee member in most important international conferences organized in the field of Power Electronics. Several times, he was the recipient of the Best Researcher Award from the University of Tabriz. Prof. Babaei has been included in the Top One Percent of the World's Scientists and Academics according to Thomson Reuters' list in 2015, 2016, 2017 and 2018. From Oct. 1st until Dec. 30th 2016, he has been a Visiting Professor at the University of L'Aquila, Italy.

Organizer 4: Sertac Bayhan, sbayhan@hbku.edu.qa (IEEE Number: 92578910), Associate Research Scientist, Qatar Environment and Energy Research Institute, Hamad Bin Khalifa University; Associate Professor, Gazi University, Ankara, Turkey



Sertac Bayhan (M'14, SM'18) received the B.Sc. (as valedictorian), M.Sc., and Ph.D. degrees from Gazi University, Ankara, Turkey, in 2006, 2008, and 2012, respectively, all in electrical engineering. In 2008, he joined the Electronics and Automation Engineering Department, Gazi University, as a Lecturer, where he was promoted to Assistant Professor and Associate Professor in 2013 and 2017, respectively. From 2014 to 2018, he also worked in Texas A&M University at Qatar as an Associate Research Scientist. Dr. Bayhan is currently working in Qatar Environment and Energy Research Institute (QEERI) as a Scientist.

His research interests lie in the areas of advanced control of PV and wind systems, microgrids, and smart grid applications. He has led multi-PI projects with collaborators from within TAMUQ, TAMU and Seville University, Spain. He has authored more than 110 high-impact journal and conference papers. He is the coauthor of two books and three book chapters. Dr. Bayhan has been an active Senior Member of IEEE.

Dr. Bayhan was the recipient of many prestigious international awards, such as the Research Fellow Excellence Award in recognition of his research achievements and exceptional contributions to the Texas A&M University at Qatar in 2018, the Best Paper and Presentation Recognition at the 41st and 42nd Annual Conference of the IEEE Industrial Electronics Society in 2015 and 2016, Research Excellence Travel Awards in 2014 and 2015 (Texas A&M University at Qatar), and Researcher Support Awards from the Scientific and Technological Research Council of Turkey (ten times).

Organizer 5: Min-Khay Nguyen, nmkhai00@gmail.com (IEEE Number: 90607148), Wayne State University, MI, USA



MINH-KHAI NGUYEN (Senior Member, IEEE) received the B.S. degree in electrical engineering from the Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam, in 2005, and the M.S. and Ph.D. degrees in electrical engineering from Chonnam National University, Gwangju, South Korea, in 2007 and 2010, respectively. He was a Lecturer with the Ho Chi Minh City University of Technology and Education. He was also an Assistant Professor with Chosun University, Gwangju, and Queensland University of Technology, Australia. He is currently with Department of Electrical and Computer Engineering, Wayne State University, Detroit, MI, USA. His current research interests include power electronics converters for renewable energy systems and electric vehicles. He served as a Guest Associate Editor of the IEEE TRANSACTIONS ON POWER ELECTRONICS special issue on the impedance source converter topologies and applications. He serves as an Associate Editor of Journal of Power Electronics and International Journal of Power Electronics.
