

IECON 2021 Special Session Proposal

Title of the Special Session: DC Grid Technologies and Applications: DC Grid Technologies, Circuit Breakers, Protection and Control

Description of the topic:

The development of Smart Grid brings a technological revolution from the traditional centralized ac power network. In terms of technological development, applications such as EV charging infrastructures, PV farms, battery energy storage systems, and DC data centers have become more mature and more and more appliances are being changed to dc power architectures. DC power transfer offers certain advantages over traditional AC power, such as higher power transmission efficiency, ease of synchronous control, improved system stability and power quality, and easier integration of renewable and distributed energy resources. Therefore, the development of dc grids becomes a major trend in the future energy systems. DC power architecture has already been adopted in applications, such as marine smart ships, and dc residential grid networks. DC grid architecture based on cryogenic (superconducting converters) for the aircrafts is also under consideration. The system architectures and control algorithms are two main research areas to develop dc microgrid technology. Apart from that, the system protection is another key concern in the dc grid, as it is related to the safety and stability of the grid. The demand for cost-effective dc circuit breakers continues to grow with the dc power distribution applications. Considering the rapid growth in applications, and vast research and development activities in this research area, this special session mainly focuses on new dc grid technologies, circuit breakers, protection schemes and dc converter topologies.

This special session brings together researchers, engineers and students from academia, and industry for an interactive discussion on the latest advances in DC Grid Technologies, Protection and their Applications.

The specific topics of this special session include, but not limited to:

- DC circuit breakers for LVDC, MVDC and HVDC power grids
- Superconducting fault current limiters
- Cryogenic Power Devices based Solid State Circuit Breaker topologies
- Hybrid DC Circuit Breaker - topologies, control and protection
- Power Converters for DC grids and DC transformers
- Modelling, control and stability of DC grids
- Reliability and safety analysis of DC grids and their components
- DC micro and nano grid structures
- DC grid applications related to subsea and next generation aircrafts

Names of special session organizers:

- *Organizer 1: Satish Naik Banavath, Indian Institute of Technology Dharwad, India.*
- *Organizer 2: Harish Krishnamoorthy, University of Houston, USA.*
- *Organizer 3: Sreekanth Thamballa, University of Minnesota, USA*
- *Organizer 4: Anindya Ray, Sandia National Laboratories, USA*
- *Organizer 5: Luciano Andrés García Rodríguez, Sandia National Laboratories, USA*

Short biography of the organizers:

 <p>Dr. Satish Naik Banavath e-mail: satish@iitdh.ac.in</p>	<p>Dr. Satish Naik Banavath (S'14- M'18) received the B.Tech. degree in electrical and electronics engineering from Acharya Nagarjuna University, Guntur, India, in 2010, the M.E. degree in electrical engineering from the Indian Institute of Science, Bengaluru, India, in 2012 and the Ph.D. degree in the Interdisciplinary Centre for Energy Research from Indian Institute of Science Bangalore, India in 2018. From 2012 to 2014, he was with the Defence Research and Development Organization, Ministry of Defence, Government of India, Bengaluru. Currently, he is working as an assistant professor at Indian Institute of Technology Dharwad, India. His current research interests include multilevel power converters, motor drives, DC circuit breakers and power converters for renewable energy conversion and power quality.</p>
 <p>Dr. Harish S. Krishnamoorthy e-mail: hskrishn@uh.edu</p>	<p>Dr. Harish S. Krishnamoorthy (M'15 – SM'18) received his B.Tech. degree from the Electrical and Electronics Engineering department, National Institute of Technology (NIT) Tiruchirappalli, India and his Ph.D. degree from the ECE department, Texas A&M University, College Station, USA; in 2008 and 2015, respectively. From Jun. 2008 to Jul. 2010, he worked as an Electronics Engineer with GE Energy, Hyderabad, India and received the Lean Six Sigma Green Belt certification there. From Apr. 2015 to July 2017, he was an Electrical Engineer with Schlumberger, Sugar Land, TX, USA. He has also briefly worked with Ford and Google Inc. Since Aug. 2017, Dr. Krishnamoorthy has been working as an Assistant Professor in the ECE department of University of Houston. He has published over 60 IEEE conference and journal papers; and has one granted patent. He has also co-authored a book chapter under IET. He is a Senior Member of IEEE and the Chair of the IEEE PELS Young Professionals group. He is also an Associate Editor of the IEEE Transactions on Power Electronics. His research interests are: High density power conversion; DC circuit breakers, advanced power electronics and control for applications such as electric vehicles, oil & gas (subsea and land), renewable energy, 4G/5G envelope tracking, etc.</p>
 <p>Dr. Sreekanth Thamballa e-mail: tsreekan@umn.edu</p>	<p>Dr. Sreekanth Thamballa (S'13-M'18) received the Bachelor's degree in electrical engineering from Acharya Nagarjuna University, Guntur, India, in 2010, the Master's degree in power electronics and drives from the National Institute of Technology, Tiruchirappalli, India, in 2013 and the Ph.D degree in electrical engineering from the Indian Institute of Technology Madras, Chennai, India. Currently, he is working as a postdoctoral associate at University of Minnesota, USA. His research interests include single-stage inverters design and</p>



	<p>control, topologies and control schemes for multilevel inverters in renewable energy systems and electric vehicles.</p>
 <p>Dr. Anindya Ray e-mail: anindya_ray@ieee.org</p>	<p>Dr. Anindya Ray (S'17-M'20) received his B.E. in Electrical Engineering from Indian Institute of Science, Engineering and Technology, Shibpur in 2010, M.Tech in Electrical Engineering from Indian Institute of Technology, Kharagpur in 2013, and Ph.D. in Electrical Engineering from the University of Houston in 2020. He is a postdoctoral researcher with the Energy Storage Technology and Systems Department at Sandia National Laboratories since October 2020. His current research interests include operation and control of high gain dc-dc converter, resonant dc/dc and dc/ac power conversion, and dc circuit breakers.</p>
 <p>Dr. Luciano Andrés García Rodríguez</p>	<p>Dr. Luciano Andrés García Rodríguez (S'12-M'20) received the B.S. degree in electronics engineering from the Universidad Nacional del Sur (UNS), Bahía Blanca, Argentina, in 2010, and the Ph.D. degree in electrical engineering from the University of Arkansas, Fayetteville, AR, USA, in 2019. He is a Postdoctoral Appointee with the Sandia National Laboratories, Albuquerque, NM, USA. His current research interests include novel topologies for power electronics converters, high-frequency and high-power transformer design, energy storage systems, and novel nonlinear adaptive control schemes.</p>