

PEDG 2021

Welcome Message

Welcome to the 2021 IEEE 12th International Symposium on Power Electronics for Distributed Generation Systems (PEDG 2021) that will be held virtually between June 28 – July 1, 2021. This international symposium, sponsored by the IEEE Power Electronics Society (PELS) and organized by the PELS Technical Committee on Sustainable Energy Systems, will provide a venue for experts to present the results of their cutting-edge research in power electronics and distributed generation systems. PEDG 2021 will feature all-virtual keynote and invited speeches, tutorials, and regular technical and lightning talk sessions on theory, analysis, design and development, testing, deployment, and impact of power electronics for distributed generation systems, energy storage systems, and sustainable sources.

Spread across these four days of the PEDG 2021 event, we have 11 high-profile keynote and cutting-edge invited lectures from leaders in industry, governmental organizations, national labs, and academia and 8 outstanding and relevant tutorials from the leaders and recognized experts in the field from academia, industry, and national lab. In addition, we have plurality of peer-reviewed technical-paper presentations from subject-matter experts across the globe. A subset of these technical presentations are lightning talks that provide abridged important overview on PEDG 2021 relevant subject matters. PEDG 2021 is a virtual but live event and as such, we hope you will be able to leverage that benefit and attend all of the above sessions. In addition, we also have on-demand service that provides the registered attendees of PEDG 2021 the access to the conference related material repository.

As we collectively participate in this year's symposium, please be aware of the generous support provided by our platinum sponsor Fuji Electric, gold sponsors Eaton and Typhoon HIL, and exhibitors PowerAmerica, GRid-connected Advanced Power Electronic Systems (GRAPES) Center, Smart Grid Center at Qatar (SGC-Q), and Emera & New Brunswick Power Research Centre for Smart Grid Technologies. The technical committee also thanks IEEE PELS for technical and financial sponsorships of this conference, without which the conference would not have been possible.

On behalf of the PEDG 2021 organizing committee, we would like to thank all of the attendees, the reviewers, the speakers, the PELS and IEEE supporting members for their help and assistance. We also express our deep gratitude to the tireless and volunteering efforts of the PEDG 2021 organizing committee colleagues.

Finally, we hope that each and every one of you will find the conference to be enjoyable, stimulating, and enlightening.

Prof. Jinjun Liu, General Chair, Xi'an Jiaotong University, China

Prof. Željko Jakopović, Co-Chair, University of Zagreb, Croatia

Prof. Sudip K. Mazumder, Co-Chair, University of Illinois at Chicago, USA

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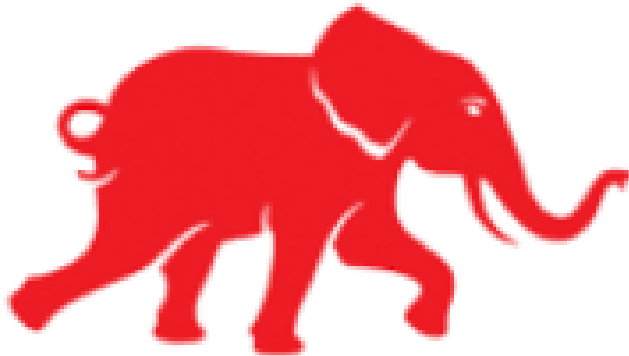


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GRAPES
Grid-connected Advanced Power Electronic Systems



SMART GRID CENTER – Extension in Qatar
TEXAS A&M ENGINEERING EXPERIMENT STATION



**Emera & NB Power
Research Centre for
Smart Grid Technologies**



PowerAmerica, GRAPES, TEES Smart Grid Center-Qatar, and UNB Emera & NB Power Research Center are Exhibitors



IEEE PELS is a Financial Sponsor

Keynote Speaker

Liuchen Chang, Ph.D.

Keynote Title: Power Decoupling and Pulse Energy Modulation for Single-Phase Grid-Connected Inverters

Dr. Liuchen Chang received B.S.E.E. from Northern Jiaotong University in 1982, M.Sc. from China Academy of Railway Sciences in 1984, and Ph.D. from Queen' University in 1991. He joined the University of New Brunswick in 1992 and is a Professor Emeritus at UNB. He was the NSERC Chair in Environmental Design Engineering during 2001-2007, and the Principal Investigator of Canadian Wind Energy Strategic Network (WESNet) during 2008-2014. He is a long-time volunteer for IEEE of over 28 years and is the President of the IEEE Power Electronics Society (2021-2022).



Dr. Chang was a recipient of CanWEA R.J. Templin Award in 2010 for his contribution in the development of wind energy technologies, Innovation Award for Excellence in Applied Research in New Brunswick in 2016 for his contributions in smart grid and renewable energy technologies, and PELS Sustainable Energy Systems Technical Achievement Award in 2018 for his contributions in distributed energy systems. He is a fellow of Canadian Academy of Engineering (FCAE). He has published 390 refereed papers in journals and conference proceedings. Dr. Chang has focused on research, development, demonstration and deployment of renewable energy based distributed energy systems and direct load control systems.

Keynote Speaker

Lynn Petersen

Keynote Title: Power Electronics Power Distribution System (PEPDS) enabled by Navy Integrated Power Electronics Building Block (NiPEBB) and through Navy Integrated Power and Energy Corridor (NIPEC)

Captain Lynn Petersen graduated from the United States Naval Academy, Annapolis with a BS in Mathematics in 1986 and commissioned an Ensign in the US Navy. Selected as an Engineering Duty Officer, he received a MSME from the Naval Postgraduate School, 1994. Following Active Duty, he was an Electrical Engineer at NSWC, Carderock Division, Annapolis, MD. Hired by ONR in May 2006, he served as S&T rep to the Electric Ships Office (ESO), PMS 320. Recalled to Active Duty, in 2008, with assignment as the Deputy Director, PMS 320, from 2008-2012. Promoted to Captain in 2009, he retired from the Navy in 2016 following 30 years of service.



From 2012-2014, he was the Navy's Director for Systems Engineering in the Deputy Assistant Secretary of the Navy office for Research, Development, Test and Evaluation. Mr. Petersen returned to ONR in 2014 and currently serves as a Program Officer leading basic research in power electronics, electromagnetism, and adaptive controls and applied research in machinery controls, WBG semiconductor applications and MVDC power distribution systems.

Married to Alena, they have two adult children. Senior member of IEEE, member of ASNE and the MRS. He and his wife are active in their church and singing.

Keynote Speakers

**Isik C. Kizilyalli, Ph.D. and
Daniel Cunningham, Ph.D.**

Keynote Title: Overview of ARPA-E Supported Transmission and Distribution Technologies Enabling a Resilient Grid of the Future



Dr. Isik C. Kizilyalli currently serves as the Associate Director for Technology at the Advanced Research Projects Agency – Energy (ARPA-E). In this role, Dr. Kizilyalli supports the Deputy Director for Technology in oversight of all technology issues relating to ARPA-E’s programs as well as assisting with program development, Program Director and Fellow recruitment, and coordinating project management across the Agency. Kizilyalli’s focus at ARPA-E includes power electronics, wide bandgap semiconductors, electronic systems for hostile environments, electrification of transport (aviation, ships, automotive, space), subsurface instrumentation, novel drilling concepts, medium voltage DC distribution grids, and grid resiliency against EMP and space weather threats. Prior to joining ARPA-E, Kizilyalli served as founder, CEO, CTO, VP at various startups. Previously, he was with Bell Laboratories. Kizilyalli was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 2007 for his contributions to Integrated Circuit Technology. He also received the Bell Laboratories’ Distinguished Member of Technical Staff award and the Best Paper Award at the International Symposium on Power Semiconductors and Integrated Circuits (ISPSD) in 2013. Kizilyalli holds his B.S. in Electrical Engineering, M.S. in Metallurgy, and Ph.D. in Electrical Engineering from the University of Illinois Urbana-Champaign. He has published more than 100 papers and holds 125 issued U.S. patents.

Dr. Daniel Cunningham is currently a Technology to Market Advisor at ARPA-E based in Washington DC. His responsibilities include overseeing commercialization activities for the agency’s power electronics programs. The programs target next generation electrical circuit designs that will accelerate the deployment of a



new class of efficient power converters for applications such as automotive drive trains, motor controllers, ultra-fast charging solutions for energy storage, data centers, and aerospace to name a few. He is also responsible for managing ARPA-E's SCALEUP program portfolio launched in 2020.

Before ARPA-E, he worked at BP Group Technology in the Chief Scientist's Office evaluating emerging energy technologies such as energy storage and alternative fuels pathways. Working at BP Solar Inc., he held the numerous positions including Director of Product Development and Director of Technology, leading multidisciplinary teams to develop new solar technologies and bringing them to market. He received a Research Partnership Award from the U.S. Department of Energy for his work in the field of thin film PV, BP Helios Award for Innovation, and has authored or co-authored over 70 publications and 12 patent publications.

He earned a Ph.D. in Electrochemistry and a B.Sc. (Hons) in Chemistry at the University of Southampton, UK, and is a Fellow of the Royal Society of Chemistry as well as a Senior Member of the IEEE.

Keynote Speaker

Yasuhiko Onishi, Ph.D.

Keynote Title: The Latest Technical Trend of RC-IGBT and SiC devices

Dr. Yasuhiko Onishi received the B.Eng. and M.Eng. degrees from Tohoku University in 1992 and 1994, respectively, and the Ph.D. degree from the Shinsyu University in 2015. He is a General Manager in the Development Division, Semiconductors Business Groups, Fuji Electric Co., Ltd., Japan. He has about 25 years of experience in research and development of power semiconductor devices, such as IGBT, power MOSFET and SiC MOSFET. His research has yielded more than 10 publications and more than 50 patents.

He is a Technical Program Committee member of the International Symposium on Power Semiconductor Devices and ICs till 2022. He is a member of the Institute of Electrical Engineers of Japan.



Keynote Speaker

Frede Blaabjerg, Ph.D.

Keynote Title: Design for Reliability in PV Systems

Dr. Frede Blaabjerg was with ABB-Scandia, Randers, Denmark, from 1987 to 1988. From 1988 to 1992, he got the PhD degree in Electrical Engineering at Aalborg University in 1995. He became an Assistant Professor in 1992, an Associate Professor in 1996, and a Full Professor of power electronics and drives in 1998. From 2017 he became a Villum Investigator. He is honoris causa at University Politehnica Timisoara (UPT), Romania and Tallinn Technical University (TTU) in Estonia. His current research interests include power electronics and its applications such as in wind turbines, PV systems, reliability, harmonics and adjustable speed drives. He has published more than 600 journal papers in the fields of power electronics and its applications. He is the co-author of four monographs and editor of ten books in power electronics and its applications.



He has received 33 IEEE Prize Paper Awards, the IEEE PELS Distinguished Service Award in 2009, the EPE-PEMC Council Award in 2010, the IEEE William E. Newell Power Electronics Award 2014, the Villum Kann Rasmussen Research Award 2014, the Global Energy Prize in 2019 and the 2020 IEEE Edison Medal. He was the Editor-in-Chief of the IEEE TRANSACTIONS ON POWER ELECTRONICS from 2006 to 2012. He has been Distinguished Lecturer for the IEEE Power Electronics Society from 2005 to 2007 and for the IEEE Industry Applications Society from 2010 to 2011 as well as 2017 to 2018. In 2019-2020 he served as a President of IEEE Power Electronics Society. He has been Vice-President of the Danish Academy of Technical Sciences. He is nominated in 2014-2020 by Thomson Reuters to be between the most 250 cited researchers in Engineering in the world.

Keynote Speakers

Andre Pereira and Madhu Chinthavali, Ph.D.

Keynote Title: The Transformer Resilience and Advanced Components (TRAC) Program and Solid State Power Substation (SSPS) Development

Mr. Andre Pereira is the Program Manager for the Transformer Resilience and Advanced Components (TRAC) program within the Office of Electricity. His program conducts cutting edge research and development for new grid hardware technologies, including Large Power Transformers (LPTs), Solid State Power Substations (SSPS), and Advanced Materials. Prior to joining DOE, Andre worked for the U.S Department of Labor as a Project Engineer. Andre has a background in Mining and Electrical engineering.



Dr. Madhu Chinthavali received his M.S. and Ph.D. degrees in electrical engineering from the University of Tennessee, Knoxville, TN, USA, in 2003 and 2015, respectively. He is presently a group leader for the power electronics systems integration group and also director of Grid Research Integration and Deployment Center GRID-C at Oak Ridge National Laboratory. Dr. Madhu Chinthavali has seventeen years' experience in power electronics R&D for vehicle and grid power systems. Dr. Chinthavali's research includes developing power electronics systems with advance semiconductor devices and developing device and system level models. In recent years the research efforts are focused on developing novel power electronics technologies like multi-port modular PE systems to solve integration issues for application-level R&D areas of vehicle charging systems including wireless charging, building energy integration systems, grid tied energy storage and PV systems and power flow control grid devices.



Keynote Speaker

Jinjun Liu, Ph.D.

Keynote Title: Autonomous Control for Coordination of Distributed Energy Source Converters in Microgrid

Dr. 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. 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. He co-authored 3 books, published over 500 peer-reviewed papers, and holds over 50 invention patents. His research interests include modeling, control, and design methods for power converters and electrified power systems 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 served as the 2015-2019 Executive Vice President and 2020-2021 Vice President for membership of IEEE PELS and was elevated IEEE Fellow in 2018. He was on the Board of China Electrotechnical Society 2012-2020 and was elected the Vice President in 2013 of the CES Power Electronics Society. Since 2013, he has been the Vice President of China Power Supply Society (CPSS) and since 2016, the inaugural Editor-in-Chief of *CPSS Transactions on Power Electronics and Applications*.

Keynote Speaker

John D. McDonald, P.E.

Keynote Title: Grid Modernization: Technological Advancements Beyond Smart Grid

Mr. John D. McDonald, P.E., is Smart Grid Business Development Leader for GE's Grid Solutions business. John has 46 years of experience in the electric utility transmission and distribution industry.



John received his B.S.E.E. and M.S.E.E. (Power Engineering) degrees from Purdue University, and an M.B.A. (Finance) degree from the University of California-Berkeley. John is a Life Fellow of IEEE (member for 50 years), and was awarded the IEEE Millennium Medal, the IEEE Power & Energy Society (PES) Excellence in Power Distribution Engineering Award, the IEEE PES Substations Committee Distinguished Service Award, the IEEE PES Meritorious Service Award, the 2015 CIGRE Distinguished Member Award and the 2015 CIGRE USNC Attwood Associate Award.

John is Past President of the IEEE PES, the VP for Technical Activities for the US National Committee (USNC) of CIGRE, the Past Chair of the IEEE PES Substations Committee, and the IEEE Division VII Past Director. John was on the Board of Governors of the IEEE-SA (Standards Association) and is an IEEE Foundation Director. John received the 2009 Outstanding Electrical and Computer Engineer Award from Purdue University.

John teaches a Smart Grid course at the Georgia Institute of Technology, a Smart Grid course for GE, and Smart Grid courses for various IEEE PES local chapters as an IEEE PES Distinguished Lecturer (since 1999). John has published one hundred fifty papers and articles, has co-authored five books and has one US patent.

Keynote Speaker

Dr. Deepak Divan, Ph.D.

Keynote Title: Scaling Energy Access Solutions – Challenges and Opportunities

Dr. Deepak Divan is Professor, John E Pippin Chair, GRA Eminent Scholar and Director of the Center for Distributed Energy at the Georgia Institute of Technology in Atlanta, GA. His field of research is in the areas of power electronics, power systems, smart grids and distributed control of power systems. He works closely with utilities, industry and is actively involved in research, teaching, entrepreneurship and starting new ventures.



Dr. Divan has started several companies, including Varentec in Santa Clara, CA, where he served as Founder, President and CTO from 2011-14, and as Chief Scientist for several years after. He led the company as it developed its suite of innovative distributed real-time grid control technologies. Varentec is funded by leading green-tech Venture Capital firm Khosla Ventures and renowned investor Bill Gates. He has founded or seeded several new ventures including Soft Switching Technologies, Innovolt, Varentec and Smart Wires, which together have raised >\$160M in venture funding.

Dr. Divan is an elected Member of the US National Academy of Engineering, member of the National Academies Board on Energy and Environmental Systems and NASEM Committee on the Future Grid. He is a Fellow of the IEEE, past President of the IEEE Power Electronics Society, is a recipient of the IEEE William E Newell Field Medal and is International Steering Committee Chair of the IEEE Empower a Billion Lives global competition to crowdsource scalable energy access solutions. He has 40 years of academic and industrial experience, 75 issued and pending patents, and over 400 reviewed publications. He received his B. Tech from IIT Kanpur, and his MS and PhD degrees from the University of Calgary, Canada.

Invited Speakers

**Michele Fusero and
Henrique S. Magnago**

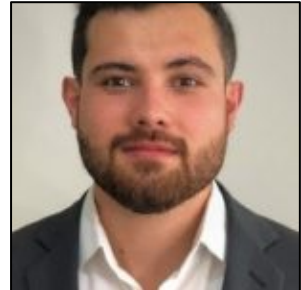
**Invited Talk Title: Hitachi ABB Power Grids E-mesh™ Solution:
From Control Design to System Validation with HIL**



Mr. Michele Fusero is a senior research and development engineer in Grid Edge Solutions business unit of Hitachi ABB Power Grids. He is responsible for control software development, testing, and microgrid system integration for e-mesh™ PowerStore™ solution. He received his MSc in Electrical Engineering from Politecnico di Torino in 2014 and until 2018 has covered a research and development position in FACTS

business unit of ABB Sweden.

Mr. Henrique S. Magnago is a power electronics and Hardware in the Loop test engineer at Typhoon HIL. His focus is in test automation of control software and firmware using ultra-high fidelity HIL, with applications to both power electronics and microgrids. His goal is to help create a more resilient grid, improving power electronics development process and system integration by means of test automation. He received his Control and Automation Engineering graduate degree from Universidade Federal de Santa Maria (UFSM) in 2017, and his Master's degree in Power Electronics from UFSM, as part of the Power Electronics and Control Group (GEPOC) in 2019. He is currently working towards his Ph.D. degree.



Invited Speaker

Lars F. Voss, Ph.D.

Invited Talk Title: Physics of Wide Band Gap and Ultra Wide Band Gap Photoconductive Semiconductor Switches and Potential for Power Electronics

Dr. Lars F. Voss received his Ph.D. degree from the University of Florida in 2008. He completed a postdoctoral appoint at Lawrence Livermore National Laboratory, where he is currently the Group Leader for MEMS, Electronics, and Photonics Technologies, Associate Program Leader for Electronic Warfare, and the Chief Engineer of the LLNL Center for Micro and Nanotechnology.



He has around 15 years of R&D experience on semiconductor materials and devices across most major materials systems. His work is primarily focused on wide band gap and ultra wide band gap semiconductors for high power and high-speed devices. He has published more than 80 peer reviewed papers and received 15 patents with 13 pending in the areas of microfabrication, materials, and devices.

PEDG 2021 SCHEDULE

Monday, June 28

8:00 am-9:45 am	Tutorial 1 (Tutorial stage A)	Tutorial 2 (Tutorial stage B)
10:00 am -10:15 am	Break	
10:00 am -11:45 am	Tutorial 3 (Tutorial stage A)	Tutorial 4 (Tutorial stage B)
11:45 am-12:00 pm	Break	
12:00 pm -1:45 pm	Tutorial 5 (Tutorial stage A)	Tutorial 6 (Tutorial stage B)
1:45 pm -2:00 pm	Break	
2:00 pm -3:45pm	Tutorial 7 (Tutorial stage A)	Tutorial 8 (Tutorial stage B)

Tuesday, June 29

8:00 am -10:00 am	Brief Welcome and Conference Update followed by Keynote Addresses (Master Stage)	
10:00 am -10:10 am	Break	
10:10 am -11:50 am	Four Technical Sessions (Stages 1 – 4)	
11:50 am-12:00 pm	Break	
12:00 pm-12:40 pm	Invited Lecture	
12:40 pm-12:50 pm	Break	
12:50 pm-1:55 pm	Lightning Talk I (Stage 1)	Virtual Booths (Stage 2 – 4)
1:55 pm-2:05 pm	Break	
2:05 pm-3:45 pm	Four Technical Sessions (Stages 1 – 4)	

Wednesday, June 30

8:00 am -10:00 am	Keynote Addresses (Master Stage)	
10:00 am -10:10 am	Break	
10:10 am -11:50 am	Four Technical Sessions (Stages 1 – 4)	
11:50 am-12:00 pm	Break	
12:00 pm-12:40 pm	Invited Lecture	
12:40 pm-12:50 pm	Break	
12:50 pm-1:55 pm	Lightning Talk II (Stage 1)	Virtual Booths (Stage 2 – 5)

1:55 pm -2:05 pm	Break
2:05 pm -3:45 pm	Three Technical Sessions (Stages 1 – 3)

Thursday, July 1

8:00 am -10:00 am	Keynote Addresses (Master Stage)
10:00 am -10:10 am	Break
10:10 am -11:50 am	Four Technical Sessions (Stages 1 – 4)
11:50 am-12:15 pm	Break
12:15 pm - 1:00 pm	Awards Session and Handover to PEDG 2022 (Master Stage)
1:00 pm	End of the conference

NOTE: All timings above are in U.S. Eastern Daylight Time zone

JOINING THE VIRTUAL EVENT

PEDG2021 Virtual event address is event.pedg2021.exordo.com

We kindly ask all PEDG 2021 participants to carefully read instructions for [Attending an event on a Live Stage](https://support.exordo.com/article/922-attending-an-event-on-a-live-stage) at (<https://support.exordo.com/article/922-attending-an-event-on-a-live-stage>). The instructions are the same for presenters and the attendees. The presenters should join the **Speaker Preparation** Session that will be hosted 10-15 minutes prior to the actual session start time on the same stage as the actual session. For instance, if you are presenting a paper in the **Technical Session 1a** which starts at 10:10 am U.S. EDT on June 29th on Stage 1, you should join the **Speaker Preparation: Technical Session 1a** that will start at 9:50 am U.S. EDT on the same stage.

All participants should also read [Technical Specifications for Joining a Live Stage](https://support.exordo.com/article/942-technical-specifications-for-joining-a-live-stage) at (<https://support.exordo.com/article/942-technical-specifications-for-joining-a-live-stage>). We strongly encourage the participants to download [Webex Events App](https://exordo.webex.com/ec3300/eventcenter/support/eventManager.do?siteurl=exordo) (<https://exordo.webex.com/ec3300/eventcenter/support/eventManager.do?siteurl=exordo>) before joining the event.

Participants who are not registered on ExOrdo system should do that before joining the virtual event. Creating an account is free on pedg2021.exordo.com.

You can explore conference program on [Virtual event site](https://event.pedg2021.exordo.com/at-a-glance) at (<https://event.pedg2021.exordo.com/at-a-glance>). The program consists of 18 live oral Technical Sessions and 3 Lightning Talk sessions. In addition, you will also have access to the [on-demand content](https://event.pedg2021.exordo.com/bundles) at (<https://event.pedg2021.exordo.com/bundles>). During the conference, on-demand content is expected to be released at 7:50 am U.S. EDT each of the 4 days and will contain the available presentation slides and videos for that day.

On the first day of the conference, Monday, June 28th, we have an exciting lineup of [Tutorial program](#), consisting of 8 tutorials from the industry, the academia, and the national lab. After official conference opening on Tuesday, June 29th, we have each day 3 [Keynote](#). Also, we have 1 [Invited Talk](#) and 3 virtual booths on June 29th as well as on June 30th. On the final day (July 1, 2021), we also have an Awards session

TUTORIALS

Power Management and Converter Control for Hybrid AC/DC Microgrids

Kai Sun
Xiaochao Hou
Tsinghua University (Academia)

Grid Forming Energy Storage: Design Challenges, Technical Performance Results and Market Opportunities for the World First Large Scale Virtual Synchronous Machine Connected to the Australian National Power System

Stanislav Cherevatskiy
Andrew Tuckey
John Glassmire
Hitachi ABB Power Grids (Industry)

Reliability of Power Electronics in PV systems: Design and Control solutions

Ariya Sangwongwanich
Frede Blaabjerg
Aalborg University (Academia)

Electrified Aerospace Propulsion and High Bandwidth Power Hardware in Loop Test Platform: Raytheon Technologies Research Center

Parag Kshirsagar
Xin Wu
Suman Dwari
Jagadeesh K. Tangudu
Jung-Muk (Michael) Choe
Parikshith Channegowda
Raytheon Technologies Research Center (Industry)

**SiC Devices for Power Electronic Systems:
Status, Challenges, and Prospects**

Victor Veliadis
Power America (Industry)

**Hybrid AC and DC Networked Microgrids Towards Grid
Modernization: Control, Optimal Design, and Implementation**

Feng Qiu
Jianzhe Liu
Xiaonan Lu
Xuan Wu
Argonne National Laboratory (National Laboratory)
Temple University (Academia)
American Electric Power (Industry)

Solid State Circuit Protection for Distributed Power Grids

John Shen
Illinois Institute of Technology (Academia)

3.3-kV SiC MOSFETs: Power Packaging and System Applications

Juan Carlos Balda
Alan Mantooth
Yue Zhao
Yuxiang Chen
University of Arkansas at Fayetteville (Academia)

PEDG 2021 PROGRAM

NOTE: All timings below are in U.S. Eastern Daylight Time zone

Monday, June 28

8:00 am Tutorial 1 (Tutorial Stage A)
Power Management and Converter Control for Hybrid AC/DC Microgrids
Kai Sun, Tsinghua University (Academia)

Tutorial 2 (Tutorial Stage B)
Grid Forming Energy Storage: Design Challenges, Technical Performance Results and Market Opportunities for the World First Large Scale Virtual Synchronous Machine Connected to the Australian National Power System
Stanislav Cherevatskiy, Hitachi ABB Power Grids (Industry)
Andrew Tuckey, Hitachi ABB Power Grids (Industry)
John Glassmire, Hitachi ABB Power Grids (Industry)

9:45 am Break

10:00 am Tutorial 3 (Tutorial Stage A)
Reliability of Power Electronics in PV Systems: Design and Control Solutions
Ariya Sangwondgwanich, Aalborg University (Academia)
Frede Blaabjerg, Aalborg University (Academia)

Tutorial 4 (Tutorial Stage B)
Electrified Aerospace Propulsion and High Bandwidth Power Hardware in Loop test Platform: Raytheon Technologies Research Center
Parag Kshirsagar, Raytheon Technologies Research Center (Industry)
Xin Wu, Raytheon Technologies Research Center (Industry)
Suman Dwari, Raytheon Technologies Research Center (Industry)
Jagadeesh K. Tangudu, Raytheon Technologies Research Center (Industry)
Jung-Muk (Michael) Choe, Raytheon Technologies Research Center (Industry)
Pariikshith Channegowda, Raytheon Technologies Research Center (Industry)

11:45 am Break

12:00 pm Tutorial 5 (Tutorial Stage A)

SiC Devices for Power Electronic Systems: Status, Challenges, and Prospects

Victor Veliadis, Power America Institute (Industry)

Tutorial 6 (Tutorial Stage B)

Hybrid AC and DC Networked Microgrids Towards Grid Modernization: Control, Optimal Design, and Implementation

Feng Qiu, Argonne National Laboratory (National Laboratory)

Jianzhe Liu, Argonne National Laboratory (National Laboratory)

Xiaonan Lu, Temple University (Academia)

Xuan Wu, American Electric Power (Industry)

1:45 pm Break

2:00 pm Tutorial 7 (Tutorial Stage A)

Solid state Circuit Protection for Distributed Power Grids

John Shen, Illinois Institute of Technology (Academia)

Tutorial 8 (Tutorial Stage B)

3.3-kV SiC MOSFETs: Power Packaging and System Applications

Juan Carlos Balda, University of Arkansas at Fayetteville (Academia)

Alan Mantooth, University of Arkansas at Fayetteville (Academia)

Yue Zhao, University of Arkansas at Fayetteville (Academia)

Yuxiang Chen, University of Arkansas at Fayetteville (Academia)

Tuesday, June 29

8:00 am Keynote I (Master Stage)

Power Decoupling and Pulse Energy Modulation for Single-Phase Grid-Connected Inverters

Liuchen Chang

Chair: *Sudip K. Mazumder*, University of Illinois at Chicago, USA

8:40 am Changeovers

8:45 am Keynote II (Master Stage)

Power Electronics Distribution Systems (PEDS) enabled by Navy Integrated Power Electronics Building Block (NiPEBB) and through Navy Integrated Power and Energy Corridor (NIPEC)

Lynn Petersen

Chair: *Sudip K. Mazumder*, University of Illinois at Chicago, USA

9:20 am Changeovers

9:25 am Keynote III (Master Stage)

Overview of ARPA-E Supported Transmission and Distribution Technologies Enabling a Resilient Grid of the Future

Isik Kizilyalli and Danny Cunningham

Chair: *Sudip K. Mazumder*, University of Illinois at Chicago, USA

10:00 am Break

Stage 1:10:10 am -11:50am

1a: Cyber-Security & Mitigation I

Chair: *Ke Ma*, Shanghai Jiaotong University, China

10:10 am Identification of a Delay Attack in the Secondary Control of Grid-Tied Inverter Systems

Mateo Greidanus, Sudip Mazumder, Ms. Nanditha Gajanur

10:30 am Cybersecurity Analytics for Virtual Power Plants

Ahmad Khan, Mohsen Hosseinzadehtaher, Mohammad Shadmand, Sudip Mazumder

10:50 am Cooperative Smart Inverter Operation during PLL-Failure

Fahmid Sadeque, Behrooz Mirafzal

11:10 am Security Vulnerability and Mitigation in Photovoltaic Systems

Yatish Dubasi, Ammar Khan, Qinghua Li, Alan Mantooth

11:30 am Cyberattack Resilient Control for Power Electronics Dominated Grid with Minimal Communication

Amin Y. Fard, Mohsen Hosseinzadehtaher, Mohammad Shadmand, Sudip Mazumder

Stage 2: 10:10 am -11:50am

1b: Stability Analysis & Simulation

Chair: *Juan Balda*, University of Arkansas, USA

10:10 am Impact of Blockchain Delay on Grid-Tied Inverter Performance

Nanditha Gajanur, Mateo Greidanus, Gab-Su Seo, Sudip Mazumder, Mohammad Abbaszada

10:30 am Stability Analysis and Capacity Distribution of Multi-paralleled Current-Controlled Inverters and Voltage-Controlled VSGs Grid-Connected System

Zixuan Guo, Xing Zhang, Ming Li, Jilei Wang, Xinxin Fu, Feng Han

10:50 am Grid Transient Stability Improvement with Increased PV Availability: A PV Inverter Reliability Enhancement Approach

Jianzhe Liu, Jiangbiao He, Bo Chen, Yichen Zhang, Feng Qiu

11:10 am Hardware-in-the-Loop Testbed for Cyber-Physical Security of Photovoltaic Farms

Jinan Zhang, Lulu Guo, Jin Ye

11:30 am A Real-Time Hardware-in-the-Loop (HIL) Cybersecurity Testbed for Power Electronics Devices and Systems in Cyber-Physical System Environments

Jinchun Choi, Deneesh Narayanasamy, Bohyun Ahn, Seerin Ahmad, Jianwu Zeng, Taesic Kim

Stage 3: 10:10 am -11:50am

1c: Converter Design & Modeling I

Chair: *Lynn Petersen*, Office of Naval Research, USA

10:10 am Characterizations of Resonant Converters Based DC Transformers for Microgrid Application

Yuqi Wei, Alan Mantooth

10:30 am Modeling and analysis of peak-current-controlled differential mode Cuk inverter

Congbo Bao, Shantanu Gupta, Sudip Mazumder

10:50 am A Control Scheme for a DC Extreme Fast Charger with RMS Current Minimization

Adel Nasiri, Necmi Altin, Garry Jean-Pierre, Saban Ozdemir

11:10 am An Optimal Design of a Hybrid Water-Cooled/Air-Cooled High Power, Medium Frequency, and Medium Voltage Solid-State Transformer

Adel Nasiri, Siavash Beheshtaein, Robert Cuzner, Ahmad Isslam El Shafei

11:30 am A New Single Stage Quadratic Buck-Boost Inverter

Eltai Ibrahim, Liuchen Chang, Mahmoud Gaafar, Mohamed Orabi

Stage 4: 10:10 am -11:50am

1d : Battery Energy Storage Systems

Chair: Herbert Hess, University of Idaho, USA

10:10 am Methodology for the Analysis of Thermal Runaway in Electric Vehicle Batteries

Peter Wilson, Oliver Holt, Christopher Vagg

10:30 am A Real-Time, Linear, Parameter-Varying, Model Predictive Control Strategy for a Battery-Supercapacitor Hybrid Energy Storage System

Chao Jia, Junwei Cui, Wei Qiao, Liyan Qu

10:50 am Three-Phase Matrix-Based Isolated AC-DC Converter for Battery Energy Storage System

Jaydeep Saha, Rishi Kumar Singh, Sanjib Kumar Panda

11:10 am Design and Analysis of a Novel Transformer-less Bidirectional DC-DC Converter with Wide Voltage Conversion Range for Energy Storage Systems

Muhan He, Ye Liu, Hao Liu, Donghao Gu

11:30 am Hybrid Bar-Delta Filter-Based Health Monitoring for Multicell Lithium-Ion Batteries Using an Internal Short-Circuit Cell Model

Taesic Kim, Chungu Lee, Justin Ochoa, Hyunjun Lee, Kyoungtak Kim, Joung-hu Park

11:50 am Break

Master Stage: 12:00 pm - 12:40pm

12:00 pm Invited Talk (Master stage)

Chair: *Mohammad Shadmand*, University of Illinois at Chicago, USA

12:40 pm Break

Stage 1: 12:50 pm -1:55pm

Lightening Talk I (Poster session)

Chair: *Niraj Shrestha*, University of Illinois at Chicago, USA

12:50 pm Real-time Implementation of a Dual-Active-Bridge Based Multi-Level Photovoltaic Converter

Zerui Dong, Luc-Andre Gregoire, Vishnu N. Vipin, Sudipta Chakraborty, Ao Sun, Adithyan Vetrivelan, Xianyong Feng, Alex Q. Huang

12:57 pm Modeling of Energy Sources in DC Microgrids with Voltage Regulation Capability

Niloofar Ghanbari, Subhashish Bhattacharya

1:04 pm Placement Evaluation of Distributed Energy Storage for Integrating EV Charging and PV Solar Infrastructure

Roozbeh Karandeh, Valentina Cecchi, Johan H. Enslin, Timothy Moss, Chance Stowe, Elaina Stuckey, Steven Whisenant

1:11 pm Hysteresis based Triangular Current Mode Control for Bridgeless Totem Pole Converter

Shantanu Gupta, Sudip Mazumder

1:18 pm A Hierarchical Microgrid Protection Scheme using Hybrid Breakers

Dehao Qin, Yousu Chen, Zheyu Zhang, Johan H. Enslin

1:25 pm Power Electronics Assisted Voltage Regulator: An Effective Solution for Mitigating the Voltage Variations Caused by High Penetration PV on a Distribution System

Keith Dsouza, Yafeng Wang, Gokhan Cakir, Mesut Baran, Tiefu Zhao

1:32 pm Small-Signal Impedance Analysis of the Impact of Grid-Forming Controllers on their DC and AC Dynamics

Ishita Ray, Leon M Tolbert

1:39 pm Thermoelectric- and DG-based Cooling Helmet

Sourojit K. Mazumder

1:46 pm Review of Recent Trends in Design of Traction Inverter for Electric Vehicle Applications

*Chandra Sekhar Goli, Somasundaram Essakiappan, Madhav Manjrekar,
Prasanth Sahu, Nakul Shah*

Stage 2: 12:50 pm - 1:55pm

Virtual Booth (TEES Smart Grid Center-Qatar)

Chair: *Moien Mohamadi*, University of Illinois at Chicago, USA

Stage 3: 12:50 pm - 1:55pm

Virtual Booth (GRAPES)

Chair: *Congbo Bao*, University of Illinois at Chicago, USA

Stage 4: 12:50 pm - 1:55pm

Virtual Booth (Typhoon HIL)

Chair: *Shantanu Gupta*, University of Illinois at Chicago, USA

1:55 pm Break

Stage 1: 2:05pm-3:45pm

3a : Grid Forming Control I

Chair: *Taesic Kim*, Texas A&M University, USA

**2:05 pm Virtual Inertia Emulation Inspired Predictive Control to Improve
Frequency Stability in Power Electronics Dominated Grid**

Anas Karaki, Mohammad Shadmand, Sertac Bayhan, Haitham Abu-Rub

**2:25 pm Isolated and Bidirectional two stage DC/AC converter with grid-forming
virtual inertia and high ripple on the DC bus for Single-Phase Grid
applications**

Alvaro Zarate, Jose Carlos U. Peña, Damian Sal y Rosas

**2:45 pm Artificial Intelligence Inspired Model Predictive Control for Frequency
Regulation in Power Electronics Dominated Grids**

*Mohsen Hosseinzadehtaher, Amin Y. Fard, Mohammad Shadmand,
Poria Fajri*

**3:05 pm Effect of Low Pass Filter in Governor Model on Large Signal Stability of
Virtual Synchronous Generator**

Ahmed Sheir, Vijay Sood

**3:25 pm Grid-Forming Control of Smart Solid-State Transformer in Meshed
Network**

Rongwu Zhu, Marco Liserre

Stage 2: 2:05pm-3:45pm

3b : Advanced Control I

Chair: Ankit Gupta, Raytheon Technologies Research Center, USA

- 2:05 pm Single Phase Grid Connected Inverter Controls using Three-Pole Three-Zero Compensator**
Md. Shamimul Islam, Sayan Roy, Abrez Mondal, Malek Ramezani
- 2:25 pm Control of Multilevel Converters for High Penetration of Renewable Energies**
Mobina Pouresmaeil, Amir Sepehr, Reza Sangrody, Shamsodin Taheri, Edris Pouresmaeil
- 2:45 pm Sliding Mode Control Scheme for a Cascaded H-Bridge Multilevel Active Front End**
Adel Nasiri, Garry Jean-Pierre
- 3:05 pm Novel control solutions to delay mitigation in grid connected and standalone inverters**
Mateo Greidanus, Subham Sahoo, Sudip Mazumder, Frede Blaabjerg
- 3:25 pm Model Predictive Control for LCL-filtered DG-grid Interfacing Inverters With State Variable and Input Disturbance Estimation**
Cheng Xue, Yunwei Li

Stage 3: 2:05pm-3:45pm

3c : Grid Connected Converters

Chair: Yichen Zhang, Argonne National Laboratory

- 2:05 pm Frequency Regulation by Distributed Energy Resource Inverters Based on Parabolic Droop Curve**
Shuang Xu, Bo Cao, Hassan Hassan, Guan hong Song, Liuchen Chang
- 2:25 pm Isolated single-stage DABRS DC/AC converter with series power decoupling to interface PV with the single phase grid**
Daniel Chavez, Damian Sal y Rosas
- 2:45 pm Modulation and Control strategy for an Isolated and Bidirectional Two-Stage DC-AC converter with high ripple on the DC-Link to interface Battery with single-phase grid**
Erick Pantaleon, Damian Sal y Rosas, Rafael Espinoza
- 3:05 pm Step-size Optimization of New Straight Line approximation-based MPPT Algorithm for Photovoltaic Systems**

Anjan Debnath, Temitayo Olowu, Imtiaz Parvez, Arif Sarwat

3:25 pm Can SiC MOSFETs improve the dynamics of grid-connected voltage source inverters?

Marius Kaufmann-Bühler, Malte Eggers, Hendrik Just, Sibylle Dieckerhoff

Stage 4: 2:05pm-3:45pm

3d : Sustainable Energy Miscellaneous Topic I

Chair: *Somasundaram Essakiappan, University of North Carolina Charlotte, USA*

2:05 pm Dynamic Photo-Voltaic Arrays for Marine Applications using Hardware-in-the-Loop Simulation Control

Peter Wilson, Ben Metcalfe, Jonathan Graham-Harper-Cater

2:25 pm A New Long-term Generation Planning Tool for Low-carbon Economy

Hongyue Zhen, Ligang Zhao, Chao Hong, Guanbiao Huang, Tinghui Zhou, Changxiang Wang, Xiaoshan Wu, Chaoyang Jing

2:45 pm Investigation on Conducted EMI for Single and Parallel Connected Inverters

Mustafeez ul Hassan, Asif Imran Emon, Kushan Choksi, Hongwu Peng, Fang Luo

4:05 pm Electrical Properties of Optically Triggered SiC JFET for Power Electronic Application

Nirajman Shrestha, Sudip Mazumder, Lars Voss

Wednesday, June 30

8:00 am Keynote IV (Master Stage)

The Latest Technical Trend of RC-IGBT and SiC devices

Yasuhiko Onishi

Chair: *Juan Balda*, University of Arkansas, USA

8:40 am Changeovers

8:45 am Keynote V (Master Stage)

Design for Reliability in PV Systems

Frede Blaabjerg

Chair: *Juan Balda*, University of Arkansas, USA

9:20 am Changeovers

9:25 am Keynote VI (Master Stage)

The Transformer Resilience and Advanced Components (TRAC) Program and Solid State Power Substation (SSPS) Development

Andre Pereira and Madhu Chinthavali

Chair: *Juan Balda*, University of Arkansas, USA

Stage 1: 10:10 am -11:50am

4a : Microgrid (Stage 1): 10:10 am -11:50am

Chair: *Ariya Sangwongwanich*, Aalborg University, Denmark

10:10 am Real Time Modelling and Hardware in Loop Validation of Smart AC Microgrid with BESS

Kalpna Shanmugam, Matteo Filippone, Pablo Almaleck, Pietro Serra

10:30 am Model Predictive Control for Black Start of Connected Communities via Autonomous Indexing

Brevann Nun, Muhammad Farooq Umar, Anas Karaki, Mohammad Shadmand, Sertac Bayhan, Haitham Abu-Rub

10:50 am Development of a Data Analytics Platform for an Electrical/Water Microgrid

Adel Nasiri, Garry Jean-Pierre, Hadi Akbari, Adam Berger

11:10 am An AC/DC Hybrid Campus Microgrid: Modeling, Control and Business Case Analysis
Phani Harsha Gadde, Munim Bin Gani, Johan H. Enslin

Stage 2: 10:10 am -11:50am

4b : Protection

Chair: *Adel Nasiri*, University of Wisconsin at Milwaukee, USA

10:10 am Modified Z Source Solid State Circuit Breaker for Medium Voltage DC Systems
Rezoana Sharmin Riana, Md. Monayem Hassan, Md. Shamim Reza, Md Maruf Hossain

10:30 am A smart grid solution integrating distributed generation and internet of things sensors for demand side management and fault identification: Case Study.
Joshua Smend, Ashot Mnatsakanyan, Sgouris Sgouridis

10:50 am Hybrid Bypass Protection of Hybrid Smart Transformers for Advanced Grid Support
Moazzam Nazir, Johan H. Enslin, Klaehn Burkes

11:10 am Data Center Isolated Parallel Ring Bus Differential Protection Scheme
Taosha Jiang, Lisa Qi, Yuzhi Zhang, Harish Suryanarayana, Mohammed Alzamli, Harry Handlin, Silvio Colombi

Stage 3: 10:10 am -11:50am

4c : Advanced Control II

Chair: *John Shen*, Illinois Institute of Technology, USA

10:10 am A Time-Varying Deep Reinforcement Model Predictive Control for DC Power Converter Systems
Milad Andalibi, Mojtaba Hajihosseini, Sam Teymoori, Maryam Kargar, Meysam Gheisarnejad

10:30 am Compensation of Multisampling-Induced Dead Band Effects on Switching-Mode Power Inverters
Yuanyuan Wu, Yuanbin He, Jianming Chen, Gang Lu, Lei Shen, Lijun Hang

10:50 am Current Ripple Compensation Algorithm for Paralleled Three-Phase Three-Wire Hybrid Frequency Inverter Systems
Tsai-Fu Wu

11:10 am Power Decoupling Control for Single Stage On-Board Charger
Changsheng Hu

11:30 am An Improved Deadbeat Direct Power Control for Grid Connected Inverter System

Satish Ramaiah, N Lakshminarasamma, Mahesh Kumar Mishra

Stage 4: 10:10 am -11:50am

4d : Converter Design & Modeling II

Chair: Frede Blaabjerg, Aalborg University, Denmark

10:10 am Reliability and Cost Modeling of a Modular Multilevel Converter

Semih Isik, Subhashish Bhattacharya

10:30 am An Energy based Approach to Calculate Actual Switching Loss for SiC MOSFET from Experimental Measurement

Shamibrota Roy, Kaushik Basu

10:50 am Modelling of Safe Operation Area for Capacitor under Mission Profile in Modular Multilevel Converter

Wenjie Jiang, Ke Ma, Xikai Xin

11:10 am High-Fidelity Models and Fast EMT Simulation Algorithms for Isolated Multi-port Autonomous Reconfigurable Solar power plant (MARS)

Qianxue Xia, Suman Debnath, Phani Ratna Vanamali Marthi, Shilpa Marti, Maryam Saeedifard

11:50 am Break

Master Stage: 12:00 pm - 12:40pm

12:00 pm Invited Talk (Master stage)

Chair: John Shen, Illinois Institute of Technology, USA

12:40 pm Break

Stage 1:12:50 pm -1:55pm

12:50 pm Lightening Talk II

Chair: Lina He, University of Illinois at Chicago, USA

12:50 pm Model Predictive Control of Multi-input Solar-Wind Hybrid Model in a DC Community with Battery Back-up

Sumana Ghosh, Jitesh Chandra Barman, Issa Batarseh

12:57 pm Distributed Application Of The Four-Switch Buck- Boost Converter To Maximize Power Extraction In Photovoltaic Modules

Luis Ricardo Candido, Aniel Silva de Morais, Daniel P. Carvalho, Fernando Lessa Tofoli, Adjeferson Custódio Gomes, Laura Ribeiro

- 1:04 pm Phase-Shifted Quad-Input LLC Converter with Variable Pulse Width Modulation**
Abdullah Alhatlani, Sumana Ghosh, Issa Batarseh
- 1:11 pm Analysis and Validation of a Robust Cyber Shield for a Grid Connected PV Inverter System via Digital Watermarking Principle**
Jorge Ramos-Ruiz, Hasan Ibrahim, Jaewon Kim, Tong Huang, Prasad Enjeti, Le Xie, PR Kumar
- 1:18 pm Evaluation of Single-Phase PV Smart Inverter Functions in Unbalanced Residential Distribution Systems**
Darren Symonette
- 1:25 pm A Medium-Voltage SiC Flying Capacitor Converter Design for 25-kV Distribution Systems**
Ahmed Rahouma, Juan Balda
- 1:32 pm A Simplified Space Vector PWM Algorithm for Four-Switch Three-phase Inverters**
Hui Zhang
- 1:39 pm Implementation of Stationary and Synchronous Frame Current Regulators for Grid Tied Inverter Using Typhoon Hardware in Loop System**
Chandra Sekhar Goli, Madhav Manjrekar, Prasanth Sahu, Arunodai Chanda, Somasundaram Essakiappan
- 1:46 pm Design of digital controllers for the reduction of low-frequency harmonic currents in Double-Star Chopper Cell-based Battery Energy Storage Systems**
Jean M. L. Fonseca, Ravi Prakash Reddy Siddavatam, Kaushik Rajashekara
- 1:53 pm EV Fleet Batteries as Distributed Energy Resources Considering Dynamic Electricity Pricing**
Qiyun Dang

Stage 2: 12:50 pm - 1:55pm

Virtual Booth (Power America)

Chair: *Mohammad A. Abbaszada*, University of Illinois at Chicago, USA

Stage 3: 12:50 pm - 1:55pm

Virtual Booth (UNBC)

Chair: *Nanditha R. Gajanur*, University of Illinois at Chicago, USA

Stage 4: 12:50 pm - 1:55pm

Virtual Booth (Fuji Electric)

Chair: *Mohsen Hosseinzadehtaher*, University of Illinois at Chicago, USA

1:55 pm Break

Stage 1: 2:05pm-3:45pm

6a : Grid Connected Systems

Chair: *Mohammad Shadmand*, University of Illinois at Chicago, USA

2:05 pm Grid compliant power conditioning system for Solid oxide fuel cells
Shruti Pal, Srinivas Gulur, Subhashish Bhattacharya, Mehrnaz Madadi

2:25 pm Generator Parameter Identification Using Time Series Model and PMU Measurements
Tinghui Zhou, Ligang Zhao, Chao Hong, Guanbiao Huang, Hongyue Zhen, Changxiang Wang, Xiaoshan Wu, Chaoyang Jing

2:45 pm Energy flow control in a modular DC-DC converter with energy recovery
Krister Haugen, Konstantinos Papastergiou, Panagiotis Asimakopoulos, Dimosthenis Pefititsis, ,

3:05 pm Improved speed and current controllers for the Doubly Fed Induction Generator for wind power systems
Francisco Emilio Rodarte, Oscar Carranza Castillo, Jaime José Rodríguez Rivas, Ruben Ortega, Daniel Memije

3:25 pm Impact of Electric Vehicle Charging on the Performance of Distribution Grid
Sina Ibne Ahmed, Daisy Flora Selvaraj, Hossein Salehfar

Stage 2: 2:05pm-3:45pm

6b : Converter Design & Modeling III

Chair: *Nanditha Gajanur*, University of Illinois at Chicago, USA

2:05 pm Double Wound Inductor Design Optimization for the Flying Capacitor Multilevel Flyback Converter using a Modified, T-Model Magnetic

Equivalent Circuit

Santino Graziani, Paul Ohodnicki, Brandon M Grainger

2:25 pm An Accurate Time Domain Analysis Based ZVS Evaluation Tool for LLC Resonant Converters

Yuqi Wei, Alan Mantooth

2:45 pm Control and Stability Analysis Of DC-DC Converters Under Power Sharing Mode

Frederico Costa dos Santos, Thamires Porth Horn, Roberto Buerger, Murilo Sintonio, Lenon Schmitz, Denizar Martins, Roberto Coelho

3:05 pm High-Performance DC Fast Charger

Nikhil Kumar, Moien Mohamadi, Sudip Mazumder

Stage 3: 2:05pm-3:45pm

6c : Advanced Control III

Chair: *Sudip Mazumder, University of Illinois at Chicago, USA*

2:05 pm Turn-on Switching Transition Control using a GaN-FET based Active Gate Drive

Debanjan Chatterjee, Sudip Mazumder

2:25 pm Dead-time rejection in permanent magnet wind generators by using a supertwisting algorithm

Daniel Memije, Oscar Carranza Castillo, Jaime José Rodríguez Rivas, Ruben Ortega, Francisco Emilio Rodarte

2:45 pm Impact of Sampling Time of Digital Controllers on the Harmonic Spectrum of Power Converters

Jigneshkumar Patel, Ahmed Sheir, Vijay Sood

3:05 pm Mode Transition for Increased Voltage Gain Range of a 4-Switch DC-DC Converter with Tri-State and Single Duty Cycle Control

Qiong Wang, Ashutosh Choubey, Luiz Lopes

3:25 pm Modified Voltage Controlled-Virtual Synchronous Machine Controller in the application of Parallel Connected Grid-Forming Inverters

Prithwiraj Roy Chowdhury, Ehab Shoubaki, Madhav Manjrekar

Thursday, July 1

8:00 am Keynote VII (Master Stage)

Autonomous Control for Coordination of Distributed Energy Source Converters in Microgrid

Jinjun Liu

Chair: *Adel Nasiri*, University of Wisconsin at Milwaukee, USA

8:40 am Changeovers

8:45 am Keynote VIII (Master Stage)

Grid Modernization: Technological Advancements Beyond Smart Grid

John D. McDonald

Chair: *Adel Nasiri*, University of Wisconsin at Milwaukee, USA

9:20 am Changeovers

9:25 am Keynote IX (Master Stage)

Scaling Energy Access Solutions – Challenges and Opportunities

Deepak Divan

Chair: *Adel Nasiri*, University of Wisconsin at Milwaukee, USA

10:00 am Break

Stage 1: 10:10 am -11:50am

7a : Advanced Components & Converter Design

Chair: *Ghanshyamsinh Gohil*, Hitachi ABB Power Grids, USA

10:10 am Airgap-less Integrated Magnetic Array using High-Performance Magnetic Material for EV Chargers

Moien Mohamadi, Sudip Mazumder

10:30 am Suppression Switching Ringing of SiC-MOSFET Inverters with Combined Design of DC Bus Snubber and Gate Drive

Lingqiang Yu, Yuying Wu, Abubakar Uba Ibrahim, Dehong Xu, Seiki Igarashi, Tatsuhiko Fujihira

10:50 am Modelling and simulation methodology for considering delamination and bonding pullout in a SiC MOSFET chip during the short-circuit phase

Yannick Dumollard, Emmanuel Batista, Jean-Marc Dienot, Laurent

11:10 am A 650V/60A Gate Driver Integrated and Wire-bondless Multichip GaN Module

Asif Imran Emon, Hayden Carlton, John Harris, Alexis Krone, Mustafeez ul Hassan, Abdul Basit Mirza, Zhao Yuan, David Huitink, Fang Luo

Stage 2: 10:10 am -11:50am

7b : Grid-Forming Control II

Chair: *Herbert Hess, University of Idaho, USA*

10:10 am Parabolic Droop Voltage Regulation by DER Inverter for Power System Support Functions

Shuang Xu, Bo Cao, Hassan Hassan, Guanhong Song, Liuchen Chang

10:30 am AC Power Flow Control – Minimizing VA Rating

Debrup Das, Anil Kondabathini

10:50 am Inertia Emulation Control using Demand Response via 5G Communications

Samaneh Morovati, Seddik Djouadi, Mohammed Olama, Jin Dong, Kevin Tomsovic, Aly Fathy, Teja Kuruganti

11:10 am Virtual Power Plant Integration into A Vertically Integrated Utility: A Case Study

Ashot Mnatsakanyan, Christos Iraklis, Ali Hussain Almazrooqi, Hamad Albeshr

Stage 3: 10:10 am -11:50am

7c Sustainable Energy Misc Topic II

Chair: *Taesic Kim, Texas A&M University, USA*

10:10 am An Overview of Quantum Security for Distributed Energy Resources

Jongmin An, Jaehak Chung, Taesic Kim, Bohyun Ahn, Jinchun Choi

10:30 am A Modified Push-Pull Topology with Phase-shift Modulation

Mandeep singh Rana, Hitesh Kumar, Santanu Mishra

10:50 am Electric Machine Emulation in Voltage-Response Mode with Differentiator Compensation

Yuhao Qi, Ke Ma, Weiyu Tang

11:10 am Enhanced Frequency-Locked Loop Based on a Third-Order Generalized Integrator

Jiayu Fang, Shuying Yang, Zhen Xie, Lingxiang Wang

Stage 4: 10:10 am -11:50am

10:10 am 7d : Lightening Talk III (Poster session)

Chair: Niraj Shrestha, University of Illinois at Chicago, USA

10:10 am Application of Improved Ant Lion Algorithm in Orderly Charging of Electric Vehicles

Xuanhui Peng, Caixue Chen, Tuo Zheng, Wendong Tang, Zhigang Xiong, Gang Ouyang

10:17 am Hybrid Control Strategy for DAB-LLC Sigma Converter

Zhiwei Chen, Wei Wang, Jie Chen, Qicai Ren, Alian Chen, Tong Liu

10:24 am Simplified Current Tracking Strategy for LCL-Based Rectifier Under Unbalanced Grid Voltage Condition

Xiang Gao, Jie Chen, Wei Wang, Tong Liu, Alian Chen, Qicai Ren

10:31 am A Modified Modular Multilevel Converter with Features of Reduction of Submodule Capacitor Fluctuation and Fault-Tolerant Operation

Ducdung Le, Dong-Choon Lee

10:38 am Grid Interactive Smart Inverter with Intrusion Detection Capability

Khaled Rayane, Haitham Abu-Rub, Mohammad Shadmand, Sertac Bayhan, Atallah Benalia

10:45 am Parameter design of capacitor for Z-source circuit breaker considering the influence of line resistance and inductance

Yuan Song, Yingting Yu, Shiwen Wang, Yu Lei, Xiong Li

10:52 am A Novel Efficient Bidirectional T-source Circuit Breaker for Low Voltage DC Distribution Network

Yuan Song, Yingting Yu, Shiwen Wang, Qinyi Liu, Xiong Li

10:59 am Stability Assessment of P ω - and PV-Droop Controls in Highly Resistive Microgrids using Analytical Impedance Models

Frederik Stallmann, Axel Mertens

11:06 am Synchronous Fault Compensator for Voltage Sensor-less Grid-Following Power Converters

Andres Tarraso, Ngoc Bao Lai, Pedro Rodriguez

11:13 am An Improved Decentralized Control Method of Grid-Connected Series Inverters with Different Power Capacities

Xiaochao Hou, Kai Sun

11:19 am Efficient Management of Energy Storage Systems using Transactive Mechanism

Ngoc Bao Lai, Andres Tarraso, Pedro Rodriguez

11:26 am A Simple Impedance Reshaping Method for Stability Enhancement of Grid-Following Inverter Under Weak Grid

Liang Huang, Chao Wu, Dao Zhou, Frede Blaabjerg

11:33 am Transient Current Optimal Control of the Hybrid Three Level Dual Active Bridge Converters Based on Triple-Phase-Shifting Control

Chunshui Du, Wenchen Guo, Song Guo, Wenlu Cai, Qiguo Shi

11:40 am Three-Dimensional Frequency Thermal Network Model of Reactor Under High Power and High Frequency Square Wave Voltage

Li Shen, Fan Xie, Bo Zhang, Chen Yang

11:47 am Voltage Sensitivity Estimation Based on Measurements of Distributed PV Inverters

Robin Strunk, Marcel Sarstedt, Axel Mertens

11:54 am Modulated Model Predictive Control With Common Voltage Injection for MMCC-STATCOM Under Unbalanced Load

Li Zhang, Yongfei Li, Xuejiao Pan

12:01 pm DCSCF Detection Method of MMC-DC-Grid Based on Feature Fusion DBN-SOFTMAX

Yuyu Zheng, Meiqin Mao

Master Stage: 12:15pm – 1:00pm

12:15 pm Awards

Chair: *Sudip K. Mazumder, University of Illinois at Chicago, USA*

1:00 pm End Conference

NOTES