Monday, 8 November

10:30 am  General
Conference opens
Stage - Main stage
Chaired by: Prof. Marco Liserre and Prof. Jianhui Wang

11:00 am  Workshop
Workshop on microgrids
Stage - Main stage
Chaired by: Prof. Xiaonan Lu and Prof. Marco Liserre

Survivability of Grid-Forming-Based Microgrids
» Wei Du (Senior Research Engineer, Pacific Northwest National Laboratory)

Frequency Regulation of Inverter-Based Resources in Isolated Power Systems
» Jin Tan (Senior Research Engineer, National Renewable Energy Laboratory)

Networked Microgrids for Grid Resiliency Enhancement
» Fei Ding (Senior Research Engineer, National Renewable Energy Laboratory)

Dynamic Microgrids in Resilient Distribution Systems
» Xiaonan Lu (Assistant Professor, Temple University)

Tuesday, 9 November

8:30 am  Keynote
The Growth of PV as the leader in renewable resources vis-a-vis Wind and other as well FPL/NextEra as world’s leader in renewables
Stage - Main stage
Chaired by: Prof. Marco Liserre

8:45 am  Panel
Plenary Panel 1: Learning of the Texas Blackout
Stage - Main stage
Chaired by: Dr. Don Tan

The Changing Resource Mix, Extreme Natural Events, and Critical Infrastructure Interdependencies – How these emerging risks contributed to the wide scale outages in ERCOT, SPP, and MISO during the February 2021 Cold Weather event
» Tom Coleman (Chief Technical Adviser, NERC)

Resource Adequacy Lessons Learned and Future Requirements in a Decarbonized Future
» Mark McGranaghan (Vice President, EPRI)

Issues and Solutions in Achieving Electrical Power Delivery Resilience
» Damir Novosel (President, Quanta Technologies)

An Open-access Cross-domain Approach to Analyzing the Impact of Extreme Events on the Electricity Sector: What We Learned from COVID-19 and 2021 Texas Winter Outage
» Le Xie (Professor, TAMU) and Hao Zhu (Assistant Professor, UT Austin)

10:30 am  Panel
Invited Session I: Grid Resiliency in power electronics dominated grid
Stage - Main stage
Chaired by: Prof. Richard Zhang
Continued from Tuesday, 9 November

**Bulk Power System Reliability Perspectives for Integrating Inverter-Based Technologies**
» Ryan Quint (Senior Manager, BPS Security and Grid Transformation, NERC)

**Black start and resiliency services**
» Vahan Gervorgian (Chief Engineer, National Renewable Energy Laboratory)

**DER and HVDC solutions in a power electronics future power system**
» Deepak Ramasubramanian (Technical Leader, EPRI)

**BESS adds grid services and increases performance of offshore wind power plants**
» Jan R. Svensson (Hitachi Power Grid)

10:30 am  
**Oral**
**Smart Transformers for hybrid grids**
*Stage - Session Stage 1*
Chaired by: Prof. Kai Sun

**Robust Control of Smart Transformer-fed Grid**
» Dr. Zhixiang Zou¹, Mr. Jian Tang¹, Mr. Yi Zhang¹, Ms. Xingqi Liu¹, Prof. Zheng Wang¹, Prof. Ming Cheng¹ (1. Southeast University)

**Architecture and Topology Overview of Modular Smart Solid-State Transformer**
» Prof. Rongwu Zhu¹, Prof. Marco Liserre² (1. Harbin Institute of Technology, Shenzhen, 2. Chair of Power Electronics, Kiel University)

**Smart Transformer as a Variable Frequency Transformer**
» Mr. Dwijasish Das¹, Prof. Chandan Kumar¹ (1. Indian Institute of Technology

10:30 am  
**Oral**
**Microgrids**
*Stage - Session Stage 2*
Chaired by: Prof. Rongwu Zhu

**A Decentralized PCC Voltage Secondary Control Method Based on Small-AC-Signal Injection for Parallel Inverters in Islanded Microgrids**
» Mr. Yidong Shi¹, Dr. Zeng Liu¹, Mr. Jiazhi Wang¹, Prof. Jinjun Liu¹ (1. School of Electrical Engineering, Xi'an Jiaotong University, Xi'an, China)

**Impacts of Asymmetrical Communication Delay on DC- Microgrid Performances**
» Prof. Rongwu Zhu¹, Prof. Marco Liserre², Ms. Johanna Becker³, Prof. Mario Paolone³ (1. Harbin Institute of Technology, Shenzhen, 2. Chair of Power Electronics, Kiel University, 3. Swiss Federal Institute of Technology)

**Functional Overview of Microgrid Control Applications**
» Dr. Reza Ganjavi¹, Dr. Markus Reischboeck¹, Dr. Igor Ljubenkovic¹ (1. Siemens AG, Smart Infrastructure, Digital Grid)

**Design and Implementation of Model Predictive Control for Parallel Distributed Energy Resource in Islanded AC Microgrids**
» Mr. Hussain Sarwar Khan¹, Mr. Jagdesh Kumar¹, Prof. Kimmo Kauhaniemi¹ (1. University of Vaasa)
10:30 am  **Oral**

**Power Electronics Architecture and Design**  
*Stage - Session Stage 3*  
Chaired by: Dr. Nicolas Muller

**Solid State Transformer: A Technological(R) evolution for a New Paradigm of Hybrid, Flexible, and Sustainable Power Grids**  
» Mr. Sérgio Coelho¹, Mr. Tiago Sousa¹, Dr. Vitor Monteiro¹, Dr. João L. Afonso¹ (1. University of Minho)

**3SSC Inverter Applied to a Photovoltaic System**  
» Mr. Matheus Ferreira¹, Mr. Elias Oliveira¹, Mr. Wesley Maciel¹, Prof. Henrique Braga¹ (1. Universidade Federal de Juiz de Fora)

**A Modular Scalable SiC-based Flexible-Combined Heat and Power System Interface Converter with Small Capacitor and Advanced Grid-Support Functions**  
» Prof. Bo Wen¹, Ms. Yu Rong¹, Ms. Qing Lin¹, Mr. Alok Kumar², Dr. Boran Fan¹, Mr. Matthias Spieler¹, Prof. Virgilio Centeno², Prof. Rolando Burgos¹ (1. Virginia Tech, CPES, 2. Virginia Tech)

12:40 pm  **General**

**Prep session**  
*Stage - Main stage*

12:45 pm  **Panel**

**Plenary Panel II: Power Converter Technologies**  
*Stage - Main stage*  
Chaired by: Prof. Johan Enslin

**Renewable Integration and the Increased use of Inverter Based Resources in Power Grids**  
» Ben Kroposki (Director - Power Systems Engineering Center, National Renewable Energy Laboratory)

**HVDC & FACTS (Flexible AC Transmission Systems) including Wide Band Gap power electronics applications**  
» Ram Adapa (Technical Executive, EPRI)

**Converter technology for up to 100% converter-based Generation**  
» Leo Casey (Power Systems Lead Engineer, Google X)

**Converter structure and protection in partial MicroGrids**  
» Aleks Vukojevic (Senior Manager - Smart Grid & Innovation, ComEd)

2:30 pm  **Panel**

**Invited Session II Power Converter modelling in power system**  
*Stage - Main stage*  
Chaired by: Prof. Costas Vournas

**Stability of a future transmission grid with a high penetration of power electronic converters**  
» Thierry Vancutsem (Professor, and Xavier Guillard, University of Liege)
Continued from Tuesday, 9 November

New developments in the WECC modeling group for converter modeling in transient stability studies
» Vijay Vittal (Professor, Arizona State University)

Simulation Methods for Transients in Low Inertia Power Systems
» Antonello Monti (Professor, RWTH Aachen)

Basic definition of active and apparent power and power factor in unbalanced, distorted systems
» Trevor Gaunt (Professor, University of Cape Town)

Graph Computing based ADMM approach for Security Constrained Unit Commitment in Hydro-thermal Power Systems
» Dr. Longfei Wei¹, Dr. Yachen Tang², Dr. Xuan Zhang¹, Dr. RenchangDai³, Prof.ArifSarwat⁴ (1. Hitachi Energy, 2. Envision Digital Inc., 3. Puget Sound Energy, 4. Florida International University)

Ransomware Attack Modeling and Artificial Intelligence-Based
Ransomware Detection for Digital Substations
» Mr. Syed Alvee¹, Mr. Bohyun Ahn¹, Prof. TaesicKim², Ms. YingSu ³, Mr. YoungWooYoun⁴, Dr. Myung-HyoRyu⁴ (1. Texas A, 2. Texas A&M University-Kingsville, 3. The University of Texas at Austin, 4. Korea Electrotechnology Research Institute)

Fault Characteristics Analysis on 56 Bus Distribution System with Penetration of Utility-scale PV Generation
» Ms. Biqi Wang¹, Prof. Rolando Burgos¹, Prof. Bo Wen¹, Dr. Ye Tang² (1. Center for Power Electronics Systems, Virginia Tech, 2. Virginia Tech)

Flexible Power Point Tracking for Active Power Regulation in String-Inverter PV Plants with Power Optimizers
» Dr. Nicolas Muller¹, Mr. Jorge Barria², Dr. Lorenzo Reyes-Chamorro¹ (1. Universidad Austral de Chile, 2. INVENT UACh)

Integration of F-CHP systems with PMU functionality to provide grid services in response to duck curve
» Mr. Alok Kumar¹, Prof. Virgilio Centeno¹, Mr. Tobias Ahlgrim² (1. Virginia Tech, 2. Siemens)

Observability Analysis for a Single-Phase Inverter Using Linear State-Space Equations
» Mr. Jeanpierre Valentin¹, Prof. Eduardo Ortiz¹, Dr. Rachid Darbali-Zamora² (1. University of Puerto Rico Mayagüez Campus, 2. Sandia National Laboratories)
Continued from Tuesday, 9 November

Design and Testing of a SiC-based Solid-State Bypass Switch for 1 kV Submodules of Switching Cycle Control-based Modular Multilevel Converters
Mr. Sri Naga Vinay Mutvala, Dr. Igor Cvetkovic, Dr. Christina DiMarino, Dr. Dushan Boroyevich (1. Center for Power Electronics Systems, Virginia Tech)

Dynamic Phasor Modeling of Three Phase Voltage Source Inverters
Mr. Arash Nazari, Dr. Yaosuo Xue, Mr. Jayesh Kumar Motwani, Dr. Igor Cvetkovic, Dr. Dong Dong, Dr. Dushan Boroyevich (1. Center for Power Electronics Systems, Virginia Tech, 2. Oak Ridge National Laboratory, Oak Ridge)

Optimized phase shift Control for dc link Current Minimization in Automotive Multi Converter Applications
Mr. Wei Juin Choy, Prof. Giampaolo Buticchi, Dr. Abraham Marquez, Prof. Michael Galea, Prof. Jose Leon (1. University of Nottingham, 2. University of Nottingham Ningbo China, 3. University of Seville)

Consensus-Based Distributed Control for Improving the Sharing of Unbalanced Currents in Three-phase Three-wire Isolated Microgrids
Dr. Claudio Burgos, Mr. Felipe Donoso, Dr. Jacqueline Llanos, Mr. Manuel Martinez-Gomez, Dr. Helmo K. Morales-Paredes, Dr. Miguel Torres (1. Institute of Engineering Sciences, Universidad de O’Higgins, 2. Dept. of Elect. Engineering, Universidad de Chile, 3. Dept. of Elect. and Electronics Engineering, Universidad de las Fuerzas Armadas ESPE, 4. Group of Automation and Integrated Systems, Sao Paulo State University (Unesp))

2:30 pm Oral
DC Systems
Stage - Session Stage 3
Chaired by: Prof. Gokhan Ozkan

Power Flow Solvers for Medium Voltage Direct Current (MVDC) Microgrids
Dr. Mona Ghassemi, Mr. Ashkan Barzkar (1. Virginia Tech)

Voltage Regulation and Battery Stress-reduction Strategy for DC microgrid
Mr. Anjan Debnath, Mr. Temitayo Olowu, Mr. Sukanta Roy, Prof. Ari S. Sarwat (1. Florida International University)

Hybrid AC Transmission System with Back-to-Back Converter Configuration and Multi-Terminal DC Operation
Mr. Mojtaba Ahanch, Prof. Roy McCann, Prof. Alan Mantooth (1. University Arkansas)

Artificial Neural Network-Based Voltage Control of DC/DC Converter for DC Microgrid Applications
Mr. Hussain Sarwar Khan, Mr. Ihab Mohamed, Prof. Kimmo Kauhaniemi, Dr. Lantao Liu (1. University of Vaasa, 2. Luddy School of Informatics, Computing, and Engineering, Indiana University, Bloomington)

A SOC-feedback Control Scheme for Fast Frequency Support with Hybrid Battery/Supercapacitor Storage System
Prof. Sergio Bruno, Dr. Giovanni De Carne, Dr. Cosimo Iurlaro, Dr. Carmine Rodio, Dr. Mino Specchio (1. Polytechnic University of Bari, 2. Karlsruhe Institute of Technology)
Wednesday, 10 November

8:30 am  Panel
Plenary Session III: Inverter-Based Protection and Standards
Stage - Main stage
Chaired by: Prof. Marco Liserre

Protection and Control of systems with High penetration of IBRs via Dynamic State Estimation
» Sakis Meliopoulos (Professor. Georgia Tech)

Impact of IEEE 1547-2018 Inverter Performance Categories on Grid Performance/Protection
» Barry Mather (PhD. NREL)

Grid forming Inverter Performance - A comparison case of protection and controls with grid-tie inverters
» Farid Katiraei (PhD. Quanta Services)

Operation and Protection of Microgrids with High Penetration of IBRs
» Sukumar Brahma (Professor. Clemson University)

10:45 am  Panel
Invited Session III: Towards 100% Renewable Penetration
Stage - Main stage
Chaired by: Prof. Kai Sun

The role of energy storage in carbon-free society
» Changyong Wang (PhD. Delta Electronics)

10:45 am  Oral
Storage Systems
Stage - Session Stage 1
Chaired by: Prof. Chandan Kumar

A PowerConversion System For Large-scale Reversible SOFC Energy Storage System
» Mr. Hong Sheng Chong\(^1\), Prof. Kai Sun\(^1\), Mr. Huan Chen\(^1\) (1. Tsinghua University)

SEPIC and Flyback Converters for Isolated Photovoltaic Battery Charging Application
» Dr. Nadia Tan\(^1\), Mr. Filippo Savi\(^2\), Prof. Giampaolo Buticchi\(^1\), Mrs. Sulaiha Ahmad\(^3\), Prof. Chris Gerada\(^4\) (1. University of Nottingham Ningbo China, 2. University of Modena and Reggio Emilia, 3. University Tenaga Nasional, 4. University of Nottingham)

Modeling of power electronics for system-level analyses and stability studies
» Igor Cvetkovic (Technical Director. Virginia Tech)

Matrix-based single-stage isolated AC-DC bidirectional converters for PV and battery integration with the medium-voltage utility grid
» Sanjib Kumar Panda (Professor. National University of Singapore)

Advanced power electronics technologies for distributed energy systems
» Rae-Young (Ryan) Kim (Professor. Hanyang University)
Continued from Tuesday, 10 November

Development of a multi-timescale method for classifying hybrid energy storage systems in grid applications
Mrs. Christina Zugschwert¹, Mr. Sebastian Goeschl¹, Prof. Karl-Heinz Pettinger¹ (1. University of Applied Sciences Landshut Technology Center Energy, 2. Skolkovo Institute of Science and Technology, Center for Energy Science and Technology)

Transitive Energy Control for Node Voltage Stability of Using Energy Storage
Dr. Chendan Li¹, Dr. Jingpeng Yue², Prof. Olav Bjarte Fosso¹ (1. NTNU, 2. Guangdong Power Grid Co., Ltd)

EMI Investigation of Power Electronics Interfaces in Modern Electricity Grids
Mr. Yi Liu¹, Prof. Rongwu Zhu², Mr. Yang Lin³, Ms. Qinger Geng⁴, Mr. Taowen Huang⁴, Mr. Lin Fu⁴ (1. Harbin Institute of Technology, Shenzhen, 2. Harbin Institute of Technology, Shenzhen, 3. Shanghai Meike Test Technology Co., Ltd, 4. Shanghai Meike Test Technology Co., Ltd)

Ransomware Security Threat Modeling for Photovoltaic Systems
Ms. Ying Su¹, Mr. Bohyun Ahn², Mr. Syed Alvee³, Prof. Taesic Kim⁴, Dr. Jinchun Choi³ (1. The University of Texas at Austin, 2. Texas A & M University-Kingsville, 3. Texas A and M University-Kingsville, 4. Texas A&M University-Kingsville)

Physics Guided Data-Driven Characterization of Anomalies in Power-Electronic Systems
Mr. Kaustubh Bhatnagar¹, Dr. Subham Sahoo¹, Prof. Florin Iov¹, Prof. Frede Blaabjerg¹ (1. Aalborg University)

Secure Firmware Update and Device Authentication for Smart Inverters using Blockchain and Physically Unclonable Function (PUF)-Embedded Security Module
Dr. Jinchun Choi¹, Mr. Bohyun Ahn¹, Ms. Swathi Pedavalli¹, Mr. Seerin Ahmad¹, Ms. Abigail Villasenor¹, Prof. Taesic Kim² (1. Texas A and M University-Kingsville, 2. Texas A&M University-Kingsville)

Wired Ethernet Device Authentication at the Physical Layer
Mr. Lucas Torlay¹, Dr. William Suski², Prof. Johan Enslin¹, Dr. Harlan Russell¹ (1. Clemson University, 2. Applied Engineering Concepts, Inc.)

Fault, protections and security
Stage - Session Stage 2
Chaired by: Dr. Jiangfeng Wang

Control of Power Converters
Stage - Session Stage 3
Chaired by: Dr. Marius Langwasser

Resilient Model based Predictive Control Scheme Inspired by Artificial Intelligence Methods for Grid-Interactive Inverters
Mr. Matthew Baker¹, Mr. Hassan Althuwaini², Dr. Mohammad Shadmand¹ (1. University of Illinois at Chicago, 2. University of Illinois)

Current Harmonic Compensation by Active Power Filter Using Neural Network-Based Recognition and Controller
Mr. Sahand Ghaseminejad Liasi¹, Dr. Ramtin Hadidi¹, Mrs. Nargessadat Ghiass¹ (1. Clemson University)
Analysis of Inter Converter Interactions using Harmonic State Space Modeling

» Mr. Jayesh Kumar Motwani¹, Dr. Yaosuo Xue², Mr. Arash Nazari¹, Dr. Dong Dong¹, Dr. Igor Cvetkovic¹, Dr. Dushan Boroyevich¹ (1. Center for Power Electronics Systems, Virginia Tech, 2. Oak Ridge National Laboratory, Oak Ridge)

Modeling and Stability Analysis of Converter-Dominated Grids with Dynamic Loads

» Mr. Huoming Yang¹, Mr. Malte Eggens¹, Mr. Peter Teske¹, Prof. Sibylle Dieckhoff¹ (1. Technische Universität Berlin)

10:45 am Oral

Grid-Forming Converters

Stage - Session 4

Chaired by: Prof. Johan Enslin

Homogeneity Realization for Cluster of Heterogeneous Grid-forming Inverters

» Mr. Muhammad F. Umar¹, Mr. Mohsen Hosseinzaadehataber¹, Dr. Mohammad Shadmand¹ (1. University of Illinois at Chicago)

Impact of Grid Forming Power Converters on the Provision of Grid Services through VSC-HVdc Systems

» Mr. Anuradha Mudalige¹, Dr. Marius Langwasser¹, Prof. Marco Liserre¹ (1. Chair of Power Electronics, Kiel University)

A Fault Detection Scheme for Islanded-Microgrid with Grid-Forming Inverters

» Dr. Seyed Fariborz Zarei¹, Dr. M. Amin Ghasemi², Dr. Saeed Peyghami³, Prof. Frede Blaabjerg³ (1. Qom University of Technology, 2. Bu-Ali Sina University, 3. Aalborg University)

Impact of Virtual Admittance on Small-Signal Stability of Grid-Forming Inverters

» Mr. Liang Huang¹, Dr. Chao Wu², Dr. Dao Zhou¹, Dr. Frede Blaabjerg¹ (1. Aalborg University, 2. Shanghai Jiaotong University)