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-e-vis Wind and other as well FPL/NextEra as world's leader in renewables

Stage - Main stage

Chaired by: Prof. Marco Liserre

The Growth of PV as the leader in renewable resources vis-e-vis Wind and other as well FPL/NextEra as world's leader in renewables

» Matt Valle (Vice President, NextEra)

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

Guwahati)

Versatile Control Functions of Hybrid Solid-State Transformers in Distribution Systems

» Mr. Lizhi Ding[1], Prof. Xiaonan Lu[1], Prof. Alex Huang[2] (1. Temple University, 2. University of Texas)

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**
	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 Shi[1], Dr. Zeng Liu[1], Mr. Jiazhi Wang[1], Prof. Jinjun Liu[1] (1. School of Electrical Engineering, Xi'an Jiaotong University, Xi'an, China)

Impacts of Asymmetrical Communication Delay on DC- Microgrid Performances

» Prof. Rongwu Zhu[1], Prof. Marco Liserre[2], Ms. Johanna Becker[3], Prof. Mario Paolone[3] (1. Harbin Institute of Technology, Shenzhen, 2. Chair of Power Electronics, Kiel University, 3. Swiss Federal Institute of Technology)

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

Functional Overview of Microgrid Control Applications

» Dr. Reza Ganjavi[1], Dr. Markus Reischboek[1], Mr. Igor Ljubenkovic[1] (1. Siemens AG, Smart Infrastructure, Digital Grid)

Robust Control of Smart Transformer-fed Grid

» Dr. Zhixiang Zou[1], Mr. Jian Tang[1], Mr. Yi Zhang[1], Ms. Xingqi Liu[1], Prof. Zheng Wang[1], Prof. Ming Cheng[1] (1. Southeast University)

Architecture and Topology Overview of Modular Smart Solid-State Transformer

» Prof. Rongwu Zhu[1], Prof. Marco Liserre[2] (1. Harbin Institute of Technology, Shenzhen, 2. Chair of Power Electronics, Kiel University)

Design and Implementation of Model Predictive Control for Parallel Distributed Energy Resource in Islanded AC Microgrids

» Mr. Hussain Sarwar Khan[1], Mr. Jagdesh Kumar[1], Prof. Kimmo Kauhaniemi[1] (1. University of Vaasa)

Smart Transformer as a Variable Frequency Transformer

» Mr. Dwijasish Das[1], Prof. Chandan Kumar[1] (1. Indian Institute of Technology

Continued from Tuesday, 9 November

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 Coelho[1], Mr. Tiago Sousa[1], Dr. Vitor Monteiro[1], Dr. João L. Afonso[1] (1. University of Minho)

3SSC Inverter Applied to a Photovoltaic System

» Mr. Matheus Ferreira[1], Mr. Elias Oliveira[1], Mr. Wesley Maciel[1], Prof. Henrique Braga[1] (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 Wen[1], Ms. Yu Rong[1], Ms. Qing Lin[1], Mr. Alok Kumar[2], Dr. Boran Fan[1], Mr. Matthias Spieler[1], Prof. Virgilio Centeno[2], Prof. Rolando Burgos[1] (1. Virginia Tech, CPES, 2. Virginia Tech)

Mission-Profile Based Design of a Hybrid-Grids Feeding Smart Transformer

» Mr. Johannes Kuprat[1], Mr. Joscha Schaumburg[1], Dr. Marius Langwasser[1], Prof. Marco Liserre[1] (1. Chair of Power Electronics, Kiel University)

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 Guilland, 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)

2:30 pm **Oral**

Grid Services

Stage - Session Stage 1

Chaired by: Dr. Lorenzo Reyes-Chamorro

Flexible Power Point Tracking for Active Power Regulation in String-Inverter PV Plants with Power Optimizers

» Dr. Nicolas Muller[1], Mr. Jorge Barria[2], Dr. Lorenzo Reyes- Chamorro[1] (1. Universidad Austral de Chile, 2. INVENTUACh)

Integration of F-CHP systems with PMU functionality to provide grid services in response to duck curve

» Mr. Alok Kumar[1], Prof. Virgilio Centeno[1], Mr. Tobias Ahlgrim[2] (1. Virginia Tech, 2. Siemens)

Graph Computing based ADMM approach for Security Constrained Unit Commitment in Hydro-thermal Power Systems

» Dr. Longfei Wei[1], Dr. Yachen Tang[2], Dr. Xuan Zhang[1], Dr. Renchang Dai[3], Prof. Arif Sarwat[4] (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 Alvee[1], Mr. Bohyun Ahn[1], Prof. Taesic Kim[2], Ms. Ying Su [3], Mr. Young-Woo Youn[4], Dr. Myung-Hyo Ryu[4] (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 Wang[1], Prof. Rolando Burgos[1], Prof. Bo Wen[1], Dr. Ye Tang[2] (1. Center for Power Electronics Systems, Virginia Tech, 2. Virginia Tech)

2:30 pm **Oral**

Control in Electronic Grids

Stage - Session Stage 2

Chaired by: Prof. Arif Sarwat

Observability Analysis for a Single-Phase Inverter Using Linear State-Space Equations

» Mr. Jeanpierre Valentin[1], Prof. Eduardo Ortiz[1], Dr. Rachid Darbali-Zamora[2] (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 Mutyala[1], Dr. Igor Cvetkovic[1], Dr. Christina DiMarino[1], Dr. Dushan Boroyevich[1] (1. Center for Power Electronics Systems, VirginiaTech)

Dynamic Phasor Modeling of Three Phase Voltage Source Inverters

» Mr. Arash Nazari[1], Dr. Yaosuo Xue[2], Mr. Jayesh Kumar Motwani[1], Dr. Igor Cvetkovic[1], Dr. Dong Dong[1], Dr. Dushan Boroyevich[1] (1. Center for Power Electronics Systems, VirginiaTech, 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[1], Prof. Giampaolo Buticchi[2], Dr. Abraham Marquez[3], Prof. Michael Galea[1], Prof. Jose Leon[3] (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[1], Mr. Felipe Donoso[2], Dr. Jacqueline Llanos[3], Mr. Manuel Martinez-Gomez[2], Dr. Helmo K. Morales-Paredes[4], Dr. Miguel Torres[1] (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, São 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[1], Mr. Ashkan Barzkar[1] (1. Virginia Tech)

Voltage Regulation and Battery Stress-reduction Strategy for DC microgrid

» Mr. Anjan Debnath[1], Mr. Temitayo Olowu[1], Mr. Sukanta Roy[1], Prof. Arif Sarwat[1] (1. Florida International University)

Hybrid AC Transmission System with Back-to-Back Converter Configuration and Multi-Terminal DC Operation

» Mr. Mojtaba Ahanch[1], Prof. Roy McCann[1], Prof. Alan Mantooth[1] (1. University Arkansas)

Artificial Neural Network-Based Voltage Control of DC/DC Converter for DC Microgrid Applications

» Mr. Hussain Sarwar Khan[1], Mr. Ihab Mohamed[2], Prof. Kimmo Kauhaniemi[1], Dr. Lantao Liu[2] (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[1], Dr. Giovanni De Carne[2], Dr. Cosimo Iurlaro[1], Dr. Carmine Rodio[1], Dr. Mino Specchio[1] (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)

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)

10:45 am Oral

Storage Systems

Stage - Session Stage 1

Chaired by: Prof. Chandan Kumar

A Power Conversion 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)

Continued from Tuesday, 10 November

Development of a multi-timescale method for classifying hybrid energy storage systems in grid applications

» Mrs. Christina Zugschwert[1], Mr. Sebastian Goeschl[1], Dr. Federico Martin Ibanez[2], Prof. Karl-Heinz Pettinger[1] (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 Li[1], Dr. Jingpeng Yue[2], Prof. Olav Bjarte Fosso[1] (1. NTNU, 2. Guangdong Power Grid Co.,Ltd)

10:45 am — Oral

Fault, protections and security

Stage - Session Stage 2

Chaired by: Dr. Jiangfeng Wang

EMI Investigation of Power Electronics Interfaces in Modern Electricity Grids

» Mr. Yi Liu[1], Prof. Rongwu Zhu[2], Mr. Yang Lin[3], Ms. Qinger Geng[4], Mr. Taowen Huang[4], Mr. Lin Fu[4] (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 Su[1], Mr. Bohyun Ahn[2], Mr. Syed Alvee[3], Prof. Taesic Kim[4], Dr. Jinchun Choi[3], Prof. Scott Smith[3] (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 Bhatnagar[1], Dr. Subham Sahoo[1], Prof. Florin Iov[1], Prof. Frede Blaabjerg[1] (1. Aalborg University)

Secure Firmware Update and Device Authentication for Smart Inverters using Blockchain and Physically Unclonable Function (PUF)-Embedded Security Module

» Dr. Jinchun Choi[1], Mr. Bohyun Ahn[1], Ms. Swathi Pedavalli[1], Mr. Seerin Ahmad[1], Ms. Abigail Villasenor[1], Prof. Taesic Kim[2] (1. Texas A and M University-Kingsville, 2. Texas A&M University-Kingsville)

Wired Ethernet Device Authentication at the Physical Layer

» Mr. Lucas Torlay[1], Dr. William Suski[2], Prof. Johan Enslin[1], Dr. Harlan Russell[1] (1. Clemson University, 2. Applied Engineering Concepts, Inc.)

10:45 am — Oral

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 Baker[1], Mr. Hassan Althuwaini[2], Dr. Mohammad Shadmand[1] (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 Liasi[1], Dr. Ramtin Hadidi[1], Mrs. Nargessadat Ghiasi[1] (1. Clemson University)

Continued from Tuesday, 10 November

Analysis of Inter Converter Interactions using Harmonic State Space Modeling

» Mr. Jayesh Kumar Motwani[1], Dr. Yaosuo Xue[2], Mr. Arash Nazari[1], Dr. Dong Dong[1], Dr. Igor Cvetkovic[1], Dr. Dushan Boroyevich[1] (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 Yang[1], Mr. Malte Eggers[1], Mr. Peter Teske[1], Prof. Sibylle Dieckerhoff[1] (1. Technische Universität Berlin)

10:45 am **Oral**

Grid-Forming Converters

Stage - Session Stage 4

Chaired by: Prof. Johan Enslin

Homogeneity Realization for Cluster of Heterogeneous Grid-forming Inverters

» Mr. Muhammad F. Umar[1], Mr. Mohsen Hosseinzadehtaher[1], Dr. Mohammad Shadmand[1] (1. University of Illinois at Chicago)

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

» Mr. Anuradha Mudalige[1], Dr. Marius Langwasser[1], Prof. Marco Liserre[1] (1. Chair of Power Electronics, Kiel University)

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

» Dr. Seyed Fariborz Zarei[1], Dr. M. Amin Ghasemi[2], Dr. Saeed Peyghami[3], Prof. Frede Blaabjerg[3] (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 Huang[1], Dr. Chao Wu[2], Dr. Dao Zhou[1], Dr. Frede Blaabjerg[1] (1. Aalborg University, 2. Shanghai Jiaotong University)