

ECCE 2021 To Host Compelling Talks And Tutorials In Vancouver And Online

By David Morrison, Editor, How2Power.com

This year's IEEE Energy Conversion Congress & Exposition (ECCE 2021) marks the 13th edition of this highly successful event, which is sponsored by the IEEE Power Electronics Society (PELS) and the IEEE Industrial Applications Society (IAS). After last year's ECCE was held in a virtual only format, many participants are eager to return to a physical event, and are looking forward to this year's hybrid format. It will feature the familiar in-person conference and expo, which is to be held October 10-14, 2021 in Vancouver, Canada, in tandem with a virtual conference and expo hosted on the vFairs platform for those who cannot physically attend.

This year's conference is chaired by Giovanna Oriti, who leads an organizing committee composed of enthusiastic volunteers from industry and academia. If you're not already acquainted with the individuals responsible for this year's ECCE, see Giovanna's [Greeting Message](#) and browse our committee [list](#). This event is also supported by our friends at Smith-Bucklin, who provide support through their show management. Though they labor behind the scenes without much glory, participants appreciate the assistance provided by colleagues such as Andrea Ball and [John Heiser](#), who handles sales for the exhibition, whenever help is needed. Additionally, anyone looking for information on the exhibition can contact [Grant Pitel](#) or [myself](#) as we are exhibition co-chairs.

Many details about this year's technical program are now available on the conference website and in this article I'll share some highlights from the upcoming program.

Plenary Session

On Monday October 11, 2021 four talks are planned for the morning plenary session which runs from 8:30 am to 10:30 am pacific time. These talks have been organized by plenary session chairs Sara Roggia of MagniX and Thomas Kirk of OPAL-RT Technologies. The plenaries address timely topics in the field of energy conversion such as electric aircraft, motor technology and drives systems, and digital transformation, and are presented by authorities on these subjects from companies such as Boeing, MagniX, Tesla and Intel. The abstracts below introduce these talks.

"Electric Aircraft Opportunities & Challenges"

Speaker: Kamiar J Karimi, Boeing Senior Fellow, Boeing.

Abstract: There are multiple concepts that are being pursued to improve the environmental impact of air travel. More Electric Airplanes and several concepts for hybrid electric airplanes have been developed to support environmental performance of aviation. These aircraft required electrification of systems and propulsion systems, which resulted in significant increases in onboard power. We will review some of the key More Electric airplanes and initiatives for hybrid propulsion airplanes by the aerospace industry. Technologies that enable more electric airplanes will be discussed. There are multiple challenges with hybrid propulsion aircraft and different goals must be guaranteed for optimum performance and acceptability of these systems. We will review some of these challenges including propulsion systems, high voltage distribution systems, energy storage, and thermal management systems.

"Electric Aircraft: From Concept to Reality"

Speaker: Roei Ganzarski, CEO, magniX

There are multiple companies and programs around the world pursuing electric aviation. From pure battery electric, to hydrogen electric, to hybrid, these programs are mostly run by new entrants into the aviation industry, with some programs also being introduced by the incumbents. We will review from a new entrants perspective, what it really means to take electric propulsion and aircraft from concept to reality including challenges, pitfalls, and successes. What practical real-world lessons should be considered when taking on such an audacious goal?

“Motor Technology Selection and System Level Optimization Effects in Drive Systems”

Speaker: Konstantinos Laskaris, Principal Motor Designer, Tesla

True optimal design constitutes an important competitive advantage in electric vehicles and requires good knowledge of physics modeling, parametric design, numerical simulations, and decision making. Battery, motor, inverter and gear design space is searched during the optimization process. The efficiency and mass of the resulting powertrain affect the total cost, depending on the application. Powertrain compaction is a key objective, but it comes with reduction in system efficiency and in many cases, at higher overall cost. Moreover, higher speed, more compact systems, exhibit dominant high frequency losses, introducing the need for advanced modeling to capture the phenomena. This keynote outlines key characteristics of motor, inverter and gears to achieve optimal design with particular focus on the motor technology.

“Driving Digital Transformation”

Speaker: Irene J. Petrick, Senior Director of Industrial Innovation in the Internet of Things Group, Intel

Industry 4.0 harnesses digital tools to make industrial operations smarter, more efficient, and ultimately to operate autonomously. At the heart of this transformation lies data and its ability to drive proactive decisions. To accelerate the digital transformation journey you need both a long term vision and a digital architecture. It's not just applying digital tools to current operations. Instead, successful companies have had to rethink complex interactions between people, processes, organizational culture and technology. This presentation highlights lessons learned during Intel's three year study of over 500 people at over 400 companies.

For more about these speakers, see the Plenary Sessions [page](#).

Special Sessions

ECCE 2021 will also host a long list of interesting special sessions, many on topics that are simply too new or dynamic to be addressed fully in traditional conference sessions (the oral and poster sessions). Moreover, the special session format lends itself to more wide-ranging discussions. These sessions have been organized by special sessions chairs Xiaonan Lu of Temple University and Fei Ding of the National Renewable Energy Laboratory. The list of special sessions for this year's ECCE follows.

Cybersecurity for Power Electronics

Organizers: Alan Mantooth, Frede Blaabjerg and Sudip Mazumder

Energy Storage for Grid of the Future: Emerging Technologies, Applications and Trends

Organizer: Tu Nguyen

“ENSURE” Meets the World: the German Strategic Initiative ENSURE Presents Its Energy Outcomes

Organizers: Marco Liserre and Maximilian Dauer

Power Electronic Technologies for Distributed Energy Resources

Organizers: Liuchen Chang, Sonny Xue, Hanh-Phuc Le, Sudip Mazumder, Minjie Chen, Yongheng Yang, Gab-Su Seo, Jin Wang, Prasad Enjeti, Juan Balda, Xiongfei Wang, Ke Ma and Jose Fernando Jimenez Vargas

Wide-Bandgap Bidirectional Switches and the Applications They Enable

Organizers: Tomas Jahns and Victor Veliadis

Energy Storage Systems: Applications, Control and Interfaces

Organizer: Juan Balda

Advanced Power Electronics Integration for Renewables

Organizers: John Seuss and Suman Debnath

Thermal Design and Control for High Reliability Power Electronics, Electrical Drives, and Batteries

Organizers: Marco Liserre and Rik W. De Doncker

Advances in SiC/GaN Grid Applications to Support EV and Renewable Energy

Organizer: Victor Veliadis

Energy Access and Empower Billions of Lives: Technologies, Impact and Opportunities for PELS

Organizers: Deepak Divan, Jelena Popovic, Issa Batarseh and Sanjib Kumar Panda

Power Electronics Dominated Grids: Dynamic Modeling and Simulation for Reliable and Resilient Operation of Future Grids

Organizers: Suman Debnath and Kemal Celik

Advanced Design and Manufacturing Techniques for Electric Machines – Simulation and Test

Organizer: David Lowther

Standard Development and Industry Engagement Update from IEEE Power Electronics Society

Organizers: Johan Enslin, Matt Wikowski and Xu She

Additive Manufacturing for Electric Machines

Organizers: Franco Leonardi and Leyi Zhu

Future of wide-bandgap devices SiC, GaN and Diamond and their emerging applications in power electronics

Organizer: Tanya Gachovska

Medium- and High-Voltage Gallium Nitride Power Devices

Organizers: Yuhao Zhang and Dong Dong

Power Electronics-Based Technologies for Grid Stabilization: Grid-Forming Inverters, Control of Inverter-Based Resources (IBRs), and Advanced Testing of IBRs

Organizers: Jing Wang and Andy Hoke

Additive Manufacturing for Electrical Machines and Power Converters Design

Organizers: Bulent Sarlioglu, Ayman El-Refaie and Will Sixel

Experimental Verification versus Simulation

Organizer: Pete Wung

PV Inverter Reliability: Industry Status, Technical Gap, and Future Needs

Organizer: Zheyu Zhang and Ramanathan Thiagarajan

P2964 IEEE Standard for Datasheet Parameters and Tests for Integrated Gate Drivers

Organizer: Tanya Gachovska

Grid Integration of Inverter-Based Distributed Energy Resources: Operation, Planning, and Guidelines

Organizers: Jianzhe Liu, Kun Zhu, Jens C. Boemer, Reza Ghaemi and Xuan Wu

EMI and Insulation Related Challenges and Solutions for WBG based Power Electronic Systems

Organizers: Bulent Sarlioglu and Jin Wang

Booming the Blue Economy: A New Era for Wave and Hydrokinetic Energy

Organizers: Yue Cao, Jing Sun and Ted Brekken

Power Electronics Enabled Power System with High Penetration of Renewables

Organizers: Rui Yang and Mahshid Amirabadi

For more information on these sessions, see the Special Sessions [page](#).

Tutorials

For engineers in industry, the tutorials often represent the most practical element of any conference program and this year's ECCE tutorials offer learning opportunities across a range of important topics in power electronics and electric machine design. These sessions have been organized by tutorial chairs Yue Cao of Oregon State University and Katherine Kim of National Taiwan University. This year's list of tutorials follows with instructors listed just beneath the class titles. As with last year's conference, the necessity of attending in-person is no longer an obstacle to attending these tutorials as they will also be available on ECCE's virtual platform.

Grid Forming Technology

AM1 – Interaction Among the Grid-connected Converters through Their Synchronization Mechanism

- Marco Lissere (Christian-Albrechts-Universität zu Kiel, Germany)
- Grahame Holmes (RMIT University, Australia)
- Mario Paolone (Swiss Federal Institute of Technology, Switzerland)
- Rongwu Zhu (Harbin Institute of Technology, Shenzhen, China)
- Roberto Rosso (ENERCON, Germany)

PM1 – Grid forming power converters: Concepts, implementation and analysis

- Pedro Rodriguez (Luxembourg Institute of Science and Technology, Luxembourg)
- Xiongfei Wang (Aalborg University, Denmark)
- Rolando Burgos (Virginia Tech, US)

Solar Photovoltaic Systems

AM2 – Photovoltaic Systems – From Basics to Advanced Grid Supportive Control

- Yongheng Yang (Zhejiang University, China)

PM2 – A MATLAB/Simulink Approach of Photovoltaic Power Systems: Designing, Modeling, Simulation, and Control

- Weidong Xiao (University of Sydney, Australia)
- Jimmy Chih-Hsien Peng (National University of Singapore)
- Qiang Han (BC Hydro, Canada)

Grid Interconnection and Resiliency

AM3 – Advances in Intelligent Solid-State DC Substations for Future Interconnected DC Grids

- Rik W. De Doncker (RWTH Aachen University, Aachen, Germany)
- Jingxin Hu (RWTH Aachen University, Aachen, Germany)
- Shenghui Cui (RWTH Aachen University, Aachen, Germany)
- Johannes Voss (RWTH Aachen University, Aachen, Germany)
- Philipp Joebges (RWTH Aachen University, Aachen, Germany)

PM3 – Resiliency-Oriented Grid-Interactive Converters: Concepts, Design, and Field Implementation

- Xiaonan Lu (Temple University, US)
- Jin Tan (National Renewable Energy Laboratory, US)
- Andy Hoke (National Renewable Energy Laboratory, US)
- Lisa Qi (ABB, US)

Energy Storage

AM4 – Applying Artificial Intelligence to Battery State Estimation

- Carlos Vidal (McMaster University, Canada)
- Phillip Kollmeyer (McMaster University, Canada)
- Javier Gazzarri (MathWorks, US)

PM4 – Design and Development of Scalable Battery Testers/Emulators and Their Applications for Future Transportation Electrification

- Sheldon Williamson (Ontario Tech University, Canada)
- Uday Deshpande (D&V Electronics Ltd., Canada)

Machines and Drives

AM5 – Optimized electrical machine designs for e-mobility applications

- Mircea Popescu (Motor Design Ltd., UK)
- Philip Mellor (University of Bristol, UK)
- Nick Simpson (University of Bristol, UK)
- James Goss (Motor Design Ltd., UK)
- Melanie Michon (Motor Design Ltd., UK)
- Jonathan Godbehere (Motor Design Ltd. UK)

PM5 – Wide Bandgap Power Electronics Based Electric Machine Drives

- Jin Wang (The Ohio State University, US)
- Yousef Abdullah (Kuwait University)

Reliability and Electro-Thermal Design

AM6 – Monitoring Power Module Degradation via Lifetime-Varying Parameters

- Christoph H. van der Broeck (FEV Europe, Germany)
- Timothy A. Polom (Silicon Austria Labs, Austria)

PM6 – Cryogenic Power Electronics Design for Electrified Aircraft Propulsion

- Fei (Fred) Wang (University of Tennessee, US)
- Zheyu Zhang (Clemson University, US)
- Ruirui Chen (University of Tennessee, US)
- Shengyi Liu (Boeing Company, US)

Emerging WBG Switches

AM7 – Emerging Bidirectional Switches and Their Impact on Future AC Power Converters and Applications

- Thomas M. Jahns (University of Wisconsin – Madison, US)
- Bulent Sarlioglu (University of Wisconsin – Madison, US)
- Johann W. Kolar (ETH Zurich, Switzerland)
- Jonas Huber (ETH Zurich, Switzerland)
- Victor Veliadis (PowerAmerica, US)

PM7 – Hybrid Semiconductor Switches based Power Modules, Converters, and Systems

- Fang Luo (State University of New York at Stony Brook, US)
- Jiangbiao He (University of Kentucky, US)

EMI

AM8 – Pulse-Width-Modulation: with freedom to optimize EMI

- Dong Jiang (Huazhong University of Science and Technology, China)
- Zicheng Liu (Huazhong University of Science and Technology, China)
- Qiao Li (Hunan University, China)

PM8 – Conducted, near-field and radiated EMI emission mitigation for wide bandgap converters: fundamentals, modeling and solutions

- Cong Li (GE Research, US)
- Shuo Wang (University of Florida, US)

Design Practices

AM9 – Defining, Modeling, and Optimizing for Energy Efficiency in 5G

- Brian Zahnstecher (PowerRox, US)

PM9 – Printed Circuit Boards in Power Converter Applications: Design Considerations and Failure Mechanisms

- Ashish Arora (Exponent, US)
- Yike Hu (Exponent, US)

For more information on these sessions, including scheduling, see the Tutorials [page](#). For details on the cost of attending the tutorials and other sessions, or to register, see the Rates & Registration [page](#). For info on other aspects of the ECCE 2021 conference or exhibition, see the conference home [page](#). If you have questions that aren't answered by visits to the website, feel free to email [me](#).