

1. Session Title

Future Trends and Challenges in Vehicle Electrification Part 1: Power Electronics and Motors

2. Abstract

The electrification of transportation is accelerating to reduce CO₂ and other greenhouse gas emissions due to burning of fossil fuels. Battery electric vehicles (BEVs) are now not only hitting the personal vehicle market but also surging in trucks, buses, industrial and agricultural vehicles. With millions of EVs sold around the world, electric cars accounted for nearly 10% percent of the global passenger vehicle market in 2021. The prospect for electric vehicle is better than ever despite the current COVID-19 pandemic and other economic crisis due to war in certain part of the world. Automotive OEMs prepare to ramp up production of EVs to meet the expected strong customer demand and to fulfill regional regulatory requirements. In this special session, a panel of industry and academic experts will discuss major challenges and trends in power electronics, motors, battery and charging. Various challenges related to cost, power density, safety, cooling, performance, hardware design, NVH, controls etc. will be discussed. In addition, experts will share their views on the impact of COVID, global chip crisis and Ukraine conflict on EV components supply chain and price. Finally, the challenge related to talent acquisition and how academia, industry and government are trying to address talent shortage and workforce development in area of electrification will be discussed.

3. Session Organizers

Organizer 1: Dr. Mazharul Chowdhury, Motor Design Engineer, General Motors, Michigan



Mazharul Huq Chowdhury received B.Sc. degree from Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh, and M.A.Sc degree from the Concordia University, Montreal, Quebec, Canada in 2006, and 2010, respectively, all in electrical engineering. He completed his PhD in Electrical Engineering from NC State University, USA. His research focus is synchronous reluctance machine. From 2006 to 2008, he was working in SIEMENS as an Electrical Engineer. In 2011 he joined Nexteer Automotive, Saginaw, MI. He worked at Halla Mechatronics Bay City, MI as a Senior Electromagnetic Engineer where he is responsible for designing motors and sensors for both automotive and non-automotive application. He also worked at EATON as a technical specialist and design motors for aerospace applications. Currently, he is working at General Motors as a design engineer. His research interests include electric machines and adjustable speed drives. He is currently serving as Industry co-chair at ECCE 2022.

Organizer 2: Dr. Arshan Khan, Director- Power Electronics & Motors, CNH Industrial, Michigan



Arshan Khan is Director of Power Electronics and Electric Machines at CNH Industrial (CNH). He received his Ph.D. in Electrical Engineering from Florida International University (FIU) and M.S. in Electrical Engineering from Illinois Institute of Technology (IIT). He has gained more than a decade of experience in Vehicle Electrification while working for Fiat Chrysler, Ford Motor Company, AVL and Eaton Corporation. From 2016 to 2018, he worked as an adjunct faculty member at the University of Michigan, Dearborn. He holds three U.S. patents and published 18 peer-reviewed technical papers. In 2013, he received a prize-paper award from IEEE electric machines committee and

‘Electrified Powertrain Engineering Innovation Award’ from Ford Motor Company in 2017. He became IEEE Senior Member in 2013.

Organizer 3: Dr. Lakshmi Gopi Reddy, Power Electronics Technical Specialist, CNH Industrial, Michigan.



Lakshmi Gopi-Reddy is Power Electronics Technical specialist in the Electrification System Integration department at CNH Industrial since 2022, and previously worked as an Energy Management Engineer responsible for generation, charging and energy storage systems for Agricultural and Construction Equipment machines from 2015 to 2021. She received PhD degree in Power Electronics from the University of Tennessee, Knoxville in 2014, and during this time, worked at Oak Ridge National Laboratory for her research studies. Her research interests include inverter reliability, electrification system architecture, and electrothermal design of power electronics.

Organizer 4: Dr. Diego Troncon, Electric Machines Technical Specialist, CNH Industrial, Michigan



Diego Troncon is Electric Machines Technical Specialist in the Electrification System Integration department at CNH Industrial since 2021, previously was PhD student in the Electric Drives Laboratory (EDLab) at University of Padova, Italy from 2017 to 2021. He received the bachelor's degree in energy engineering, the master's degree in electrical engineering, and PhD in industrial engineering from the University of Padova, Padova, Italy, in 2015, 2017, and 2022, respectively. His research interests include design, control and reliability of electric machines for traction systems and off-highway electrified machineries.

4. Session Panelists/Speakers (Power Electronics and Motors)

- Dr. Ayman El-Refaie, Professor, **Marquette University**.
- Dr. Avoki Omekanda, Staff Researcher, Electric Machine & Drive Systems, **General Motors**.
- Dr. Amir Ranjbar, Senior Technical Fellow, Electrification – HV Power Electronics, **Canoo**.
- Dr. Brian McKay, Product Segment Director, Vehicle Electrification Systems, **Aptiv**.
- Dr. Saeed Siavoshani, Director, Electrification, **FEV**.
- Hossein Dadkhah, Director, **Dana Corporation**.