

Title of the Talk: “Electric Vehicle Charging Technology: Exploration and Exhortation”

Abstract: Electric vehicle charging infrastructure need to follow some charging standards and communication protocols for safe and reliable charging operation of e-vehicles. The charging standard covers the different types of charging unit based on its size, power rating and charging speed. Three different types of charging levels such as level 1, level 2 and dc fast charging are categorized as per the available charging infrastructure. Moreover, charging connector is an essential entity of the e-vehicles charging infrastructure and are available in different variety for different types of charging. A variety of DC and AC connectors are used for different levels of e-vehicle charging. In addition, e-vehicle industries use variety of communication channels along with communication protocols for reliable and safe charging operation. Li-ion batteries are commonly used in e-vehicles however, the charging of Li-ion battery pack of the e-vehicle is very critical operation and it requires an energy management system for the battery pack during charging operation. Battery Management System (BMS) is a technology dedicated to oversight electric vehicle's battery pack, which is an assembly of Li-ion battery cells, electrically organized in row-column configuration to supply targeted range of voltage and current for a duration of time against connected load scenario. The BMS has two primary functions for a battery pack: 1) keep charging and discharging operation of a battery pack safe, 2) keep the operation of a battery pack reliable. The BMS monitors cell voltage, battery pack voltage, battery current and battery cells temperature and performs various algorithms using these parameters in order to estimate state of charge (SoC), state of health (SoH) and state of envelope (SoE). BMS is used to measure voltage and stop charging when the desired voltage is reached. At that point, they might shut down the power flow; in the event of irregular or dangerous conditions. BMS also offers voltage balancing for the individual cells of the battery pack and improves overall health of the system.



About the Speaker:

Prof. Rajeev Kumar Singh received the B.Tech. degree in electrical engineering from the College of Technology, Pantnagar, India, in 2001, the M.Tech. degree in electrical machines and drives from the Indian Institute of Technology (Banaras Hindu University), Varanasi, India, in 2003, and the Ph.D. degree in electrical engineering from the Indian Institute of Technology Kanpur, Kanpur, India, in 2013. He is currently Professor and Head with the Department of Electrical Engineering, Indian Institute of Technology (Banaras Hindu University). His research interests include renewable power conversion for hybrid microgrid, power conversion for electric vehicles/hybrid electric vehicles, optimal charging/ discharging of energy storage system, and

converter modelling and control. He has published 43 Transaction/Journal papers and 91 IEEE conference papers. Prof. Singh served as associate editor of IEEE IES ItEN in 2016 and currently serving as an associate editor of IEEE Transactions on Industry Applications. He has authored 2 book chapters and has published 2 patents. Prof. Singh has supervised 7 Ph.D and 53 masters students. He has successfully completed 7 sponsored projects and 6 projects are currently underway with him. Dr. Singh is working on next generation low-cost onboard technology development to improve the charging infrastructure for EVs in the country. Dr. Singh was awarded Shyama Varshney BENCO-64 Best Educator Award by IIT (BHU) Varanasi in 2021. Presently, he is Associate Dean (Academic Affairs)-UG and also looking after various other administrative positions in IIT(BHU) Varanasi.