

## Title: EV and DER Grid Integration

**Abstract:** A significant amount (three-fourth) of the greenhouse gas (GHG) emissions accounts for energy-related emissions. The worldwide devastating effects of the climate change have accelerated to alarming levels that induced the sheer need of transition towards zero emission technologies such as electric vehicles (EVs) combined with distributed energy resources (DERs) such as wind generating units, roof top solar photovoltaic units, and battery storage to decarbonise the environment. This introduction of EVs and DERs in the energy system evolves various challenges while integrating with the grid. This special session reviews recent advances in this field.

### Rationale:

Excessive use of fossil fuel-based energy technologies results in adverse impacts of climate change at a global scale. The only remedy to this exacerbating situation is the adoption of clean energy and transportation technologies which is flourishing in many developed countries like US, UK, EU, Australia, Canada, and New Zealand. As reported by Bloomberg in April 2022, "*The world's EV fleet will soon surpass 20 million*". This gigantic penetration of EVs as well as DERs in the local and national grid causes several challenges for the power system operators.

In order to achieve effective integration of EVs and DERs into the power grid, the development and implementation of advance technologies has become inevitable such as dynamic operating envelopes, vehicle-to-grid (V2G) technology's techno-economic analysis, optimisation of network hosting capacity, community batteries/chargers, optimal operation of virtual power plants, and efficient use of smart meter recordings through the state-of-the art machine learning technologies for robust network operation and planning. These efforts can revolutionise the global energy industry in attaining better integration of clean energy obtained from DERs and clean transport (EVs) into the national grid. This effective integration will not only enhance the EV uptake but also increase the hosting capacity of DERs based clean energy worldwide.

### Topics to cover:

This session covers the following research area (but is not limited to them):

- Integration of EVs into the grid
- Reliability of microgrids and islanded networks
- Applications of AI and Machine learning in network operation and planning
- Integration of DERs into the grid
- Implementation and operation of the vehicle-to-grid technology
- Modelling issues of DERs
- Modelling of grid integration
- Cybersecurity of grid integration
- Applications of AI and Machine learning in grid integration
- Optimal dynamics operating envelopes
- Power grid issues at transmission and distribution side
- Optimal operation of community batteries and chargers
- Power quality issues with grid integration