

Special Session 3

Planning, Operation and Control of Large-Scale Electrical Vehicle for its Integration with Power Systems and Transportation Systems

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Scope of the Session:

Two-thirds of man-made global warming emission are produced by two main sectors: Electricity and Transportation. During the past decade, the proliferation of renewable generation has contributed to a significant reduction of carbon emissions from the electricity industry. The mushrooming deployment of electric vehicles (EVs) is regarded as an effective mean to cut down the emission from the transportation sector. However, the rapidly increasing penetration of EVs has a great impact on power system's planning, operation and control. Generally speaking, the impact of large scale EV integration is two-fold: The charging demands of EVs will remarkably alters the traditional load pattern, which should be carefully addressed due to the limit capacity of existing distribution networks. Furthermore, with the constant increasing of EV penetration level, the situation become more prominent so that not only distribution network, but also transmission network and generation resources needs to be updated to satisfy the increasing EV charging demands. On the other hand, provided with appropriate incentives, EVs can be treated as mobile distributed storage units which can provide operational flexibility in spatial and temporal scale. This is crucially important to distribution system where fully dispatchable resources are rare.

Unlike other stationary devices/load, EVs primarily aim to fulfill the transportation requirement of its owners, which creates a strong tie between two basic infrastructures of modern metropolis: electricity network and transportation network, which is referred to as power-traffic network (PTN) under the transition of transportation electrification. This is a new and active field and calls for cross-disciplinary research.

The topics of this special session include but are not limited to:

- Traffic flow and EV charging load modeling,
- Simulation and calculation,
- EV charging station planning,
- Interaction between power and transportation network,
- Power-traffic network modeling,
- Vehicle to grid (V2G) technology