IEEE CPE-POWERENG 2021

Special Session on Charging Networks for Electric Transport

Low-carbon transport modes have a central role in delivering existing and future mobility needs. It is expected that a substantial proportion of vehicles will be electrified over the next few years and there will be an increased degree of integration between transport modes, e.g. electric trains supplied by the fixed electrical infrastructure and charging systems for electric cars. The main challenge is the substantial modification of existing concepts and engineering practices to design new charging networks achieving the goal of decarbonising the transport sector. The drivers for change are technology innovation, mobility needs, economic requirements, environmental and social concerns for sustainability, and the impact of policies and regulations.

The challenge of future charging networks could be addressed with an integrated whole-system approach covering the electricity supply system, the electrification infrastructure (including both wired and wireless charging), and associated vehicle technologies. Attractive opportunities are offered by the integration of low carbon generation in the charging infrastructure and the use of carbon-free fuels for propulsion. The former is underpinned by the current expansion of smart grids and research is oriented on the development of the enabling power electronics technologies, as off-the-shelf solutions do not currently exist. The latter is supported by the recent momentum of hydrogen trains and associated fuel cells technologies and hydrogen generation infrastructure. Energy storage is a key component for both areas of research, although it is still not clear how to exploit their full potential and achieve the maximum benefits for the charging infrastructure while reducing the impact on the grid. In particular, energy management systems overseeing the operation of charging networks will have to respond in a quick and flexible way to the needs of electric vehicles, grids, or both. The main objective of this special session is to promote a discussion between researchers on the emerging challenges and opportunities for charging networks to enhance the integration between electric vehicles (car and trains), power grids, and hydrogen generation and improve efficiency and performance at global level.

A non-exhaustive list of the possible keywords is reported below:
Charging systems, energy management systems, vehicle-to-everything (V2X), energy storage for transport, fuel cells for traction

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