

OPEN INVITED TRACK-IFAC WORLD CONGRESS 2023

Sustainable Transportation and Energy Systems: Automation and Optimization

Proposers: Luca Parodi^a, Massimo Paolucci^a, Michela Robba^a, Giulio Ferro^a, Mariagrazia Dotoli^c, Yassine Ennassiri^a, Yrjö Majanne^b

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^a*DIBRIS-Department of Informatics, Bioengineering, Robotics and Systems Engineering, University of Genova, Italy,
email: luca.parodi@edu.unige.it*

^b*Tampere University, P.O. Box 589, FI-33014 Tampere University, Tampere, Finland*

^c*Polytechnic of Bari, Bari, Italy*

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Abstract

Sustainable transportation and energy systems have gained much more interest as key technologies to attain a considerable reduction in the greenhouse gas emissions. Nowadays, Electric Vehicles (EVs) became widely commercialized, and used by customers, and Charging Stations (CSs) are being continuously implemented to satisfy the increasing demand. Moreover, energy systems including renewables, non-renewables, hydrogen systems, CSs and distributed generation are being integrated more and more in energy communities. In this framework, new optimization methods and control approaches, technologies and ICT platforms are required for the integration of sustainable transportation and energy systems, as well as for users' management and involvement; these, all together, form the main focus of this Open Invited Track.

In recent literature, it has been shown an increasing and significant interest in the use of optimization models for the location of charging stations, charging operations (considering centralized and decentralized approaches), business models and EVs integration in smart grids, microgrids, biomass supply chain design for biodiesel production, hydrogen production management, harbors' electrification and electrical public buses management. Distribution Systems Operators, managers of cities and communities, companies in the transportation sector, and providers of charging stations and energy services are now investing in sustainable mobility through the development of new ICT platforms, tools and technologies for the integrated optimal

management of transportation and energy systems.

The proposed Open Invited Track aims to collect new advances in optimization and control approaches in transportation and energy systems, both from an application and methodological point of view.

Detailed description:

Several national and international roadmaps have set a plan, for the near future, for the total electrification of vehicles (private cars, buses, trucks, ships, etc.). Consequently, these light and heavy-duty vehicles will be widely used and new technologies will be implemented for charging stations, batteries and vehicles. Moreover, EVs will act as distributed energy resources, since they can provide regulation services and power supply, thus enabling the V2G (Vehicle-to-Grid) or the V2B (Vehicle-to-Building) operations. In this way, they would also absorb excess production of electricity from renewable sources, and return it to the grid in periods of peak loads. The number of EVs and CSs is increasing in the last years, but, unfortunately, wide usage of EVs may cause technical problems to the electrical grid (i.e., instability due to intermittent distributed loads), inefficiencies in the charging process (i.e., lower power capacity and longer recharging times), long queues and/or bad use of CSs. Moreover, it is necessary to integrate the transportation and the electrical networks in order to plan the CSs installation over the territory, the schedule of vehicles and the optimal use of CSs. This Open Invited Track focuses on optimization and control techniques applied to sustainable transportation and energy systems with a focus on EVs.

The main aim of the proposed Open Invited Track is to bring together emerging models, methods and technologies for the optimal planning and management of sustainable transportation and energy systems, and for the integration of their related networks, with a specific focus on optimization and control methods within Energy Management Systems and ICT-based platforms. Interdisciplinary approaches related to smart grids, scheduling, and transportation systems are encouraged. This Open Invited Track will also provide a forum for experts to disseminate their recent advances and views on future perspectives in the field.

Both methodological and application-oriented papers are welcomed. Submissions of scientific results from experts in academia and industry worldwide are strongly encouraged, as well as real case studies in cities. The topics of the proposed Open Invited Track are specifically related to (but not limited to) the following methods and application areas:

- Optimal planning of charging stations in smart cities
- Sustainable transportation and mobility in smart cities
- Advanced ICT technologies for the communication between vehicles and charging stations
- ICT platforms for the management of electric vehicles in cities
- Electric vehicles integration in smart grids
- Smart Charging, Vehicle to grid (V2G) and vehicle to building (V2B)
- Demand response in the energy market

- Power management in charging stations
- Biofuels and biomass supply chain
- Hydrogen for sustainable vehicles
- Modelling and identification of batteries' state of charge and health
- Optimal scheduling of EVs in smart grids
- EVs fleets' optimal management
- Discrete event optimization for sustainable mobility
- Optimal traffic assignment in presence of electric vehicles
- Optimal routing and charging of green vehicles
- Satellite navigators for electric vehicles
- Electric vehicles' demand assessment
- Modelling and simulation of green vehicles's consumes
- Advanced control of vehicles and autonomous guide
- Emerging technologies for the reduction of costs in green vehicles
- Joint design of electrical and transportation networks
- Shared electric vehicles.