Topological modelling and simulation of gas networks for multi-energy applications

TT1-A Modelling and simulation

Chairs: Maria Carmela Di Piazza and Efstratios Batzelis

11:00 Comparison of two dynamic models for a DC railway electrical network including a power electronics based bi-directional power station

N'Guessan Kouassi, Khaled Almaksour, Nicolas Navarro, Christophe Saudemont, Bruno François, Lionel Taunay, Tony Letrouvé, Benoît Robyns

ID 131 – To face environmental issues, SNCF, the French railway operator, has chosen to improve the energy efficiency of its power network by investigating solutions for regenerative braking. With the contribution of Railenium, a research and test center in the railway area, they aim to recover the braking energy by setting up a reversible inverter at the DC power station "Masséna". In this paper, the modelling of the railway electrical network including the reversible station is addressed by using AC and DC equivalent sources. The results of this modelling are then compared with the ones obtained from Esmeralda, the SNCF professional software. A first configuration is led without inverter and gives certified Esmeralda results. It is used as a validation of the discussed model despite some gaps in powers and voltages due to differences in input data. A second comparison with the inverter is also achieved. Indeed, a strategy considers the inverter as a storage system in order to reproduce its operation. The proposed model as it includes the real power electronic inverter and its associated control system allows the refinement of the Esmeralda results. For the case study, the recovered energy evolves from 17 kWh with Esmeralda to 8.5 kWh.

11:20 Topological modelling and simulation of gas networks for multi-energy applications

Enrico Vaccariello, Pierluigi Leone, Flavio Canavero, Igor Simone Stievano

ID 72 – This paper addresses the generation of a topological model of a gas network to be used in an integrated multi-carrier energy co-simulation framework. The study is based on a set of three real gas networks and emphasis is put on both a unified graph-based description and a steady-state simulation carried out via an electrical circuit analogy and classical tools for circuit analysis. An isothermal assumption is also considered and validated. The proposed approach turns out to be a first step toward a simple and viable solution for the efficient co- simulation of a possibly complex energy scenario involving renewables, electrical and gas networks.

11:40 Enhanced DC Microgrid Control for a Fast and Stable DC Bus Voltage

Sonia Moussa, Manel Jebali-Ben Ghorbal, Ilhem Slama-Belkhodja

ID 89 – DC microgrids are the new trend for renewable energy distributed systems due to their high efficiency and more suitability to new load appliances. However, some problems are still open to discussion as it is an emerging concept. In a DC microgrid, a very important issue consists on an enhanced control of the DC bus voltage.