

Next-Generation Low Voltage Microgrids: Renewable Integration, Battery Storage and Electric Vehicle Charging

ORGANIZED BY

Manuela Minetti, Università degli studi di Genova
Riccardo Loggia, Sapienza Università di Roma

The increasing penetration of renewable energy sources, together with the rapid diffusion of electric vehicles and distributed storage technologies, is profoundly transforming low-voltage electrical networks. In this context, low-voltage microgrids represent a key enabling solution to ensure efficiency, reliability, flexibility, and sustainability at the distribution and end-user levels.

This Special Session aims to provide a forum for researchers and practitioners to present recent advances, methodologies, and real-world applications related to low-voltage microgrids integrating photovoltaic systems, battery energy storage systems (BESS), and electric vehicle (EV) charging stations. Particular attention will be devoted to system architecture, control strategies, energy management, power quality, and grid interaction under both grid-connected and islanded operating conditions.

The session will address both individual and collective self-consumption scenarios, including energy communities, residential and commercial microgrids, and local energy systems, highlighting regulatory, technological, and operational challenges.

Topics of interest include, but are not limited to:

- **Design and modeling of low-voltage microgrids**
- **Integration of photovoltaic generation in LV networks**
- **Battery energy storage systems: sizing, control, and lifetime aspects**
- **EV charging infrastructure and its impact on low-voltage grids**
- **Energy management and optimization strategies**
- **Vehicle to Grid (V2G) and Grid to Vehicle (G2V) strategies and applications**
- **Grid-connected and islanded operation of microgrids**
- **Energy communities, collective self-consumption, and regulatory frameworks**
- **Real-time monitoring, control, and digitalization of LV microgrids**
- **Experimental setups, pilot projects, and field implementations**

