

Challenges of energy management of future Data Center and sustainability of energy-intensive Digital Infrastructures

ORGANIZED BY

Prof. Francesco Grimaccia, Politecnico di Milano

Prof. Rodolfo Araneo, Università Sapienza, Roma

Prof. Luigi M. Colombo, Politecnico di Milano

Prof. Maurizio Santini, Università di Bergamo

This Special Session is focused on gathering research contributions related to the study, design, and integration of innovative equipment, systems, technologies and algorithms able to reach and enable proper energy management of future Data Center and energy-intensive Digital Infrastructure.

Nowadays Data Centers represent foundational infrastructure for the digital economy and fourth industrial revolution, essential for modern society and any business operations. However, their growing energy and water demands, driven by Artificial Intelligence and cloud computing applications, create significant technical, environmental and social challenges.

The industrial exploitation of renewable sources, energy storage systems and advanced cooling technologies require a stepwise development of all the processes necessary for building up and managing a fundamental system to support global digitalization trend of all the economic sectors.

The Special Session will gather contributions of comprehensive conceptual, modelling and implementation of novel approaches and techniques, starting from multi-physics systems through advanced artificial intelligence approaches, ending to proof of concepts, pilot case study or relevant demonstrators for scientific community, including (but not limited to):

- **Advanced solutions and techniques for integration of renewable energy sources in high performance Data Centers**
- **Technologies and tools for sustainable energy systems to supply Hyperscale Data Centers**
- **Advanced cooling systems for high-density data centers, targeting low Power Usage Effectiveness (PUE) and high thermal efficiency.**
- **Liquid and dielectric immersion cooling solutions (direct-to-chip, rear-door heat exchangers; single- and two-phase)**
- **Digital infrastructure waste-heat recovery and reuse for district heating and other local loads to preserve current decarbonization plans**
- **Predictive-proactive data-driven techniques for Digital Infrastructure Energy Management**
- **Case study and demonstrators of future-proof digital infrastructure: implications of twin transition for scenario planning**
- **Integration of BESS to enhance resilience and power continuity of digital and TLC infrastructures**
- **AI-ready cloud infrastructures: challenges on space, power and efficient cooling**
- **Energy efficiency, regulatory compliance and reduction of Data Center carbon footprint.**

