

## ENERGY UTILIZATION AND STORAGE

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### ABSTRACT

This thematic session will focus on models and numerical methods for energy use, storage, and conversion, with a particular emphasis on thermal energy conversion processes. As energy systems become increasingly complex and decentralized, accurate modelling and simulation tools are essential to optimize efficiency, sustainability, and integration across multiple energy sectors. This session aims to highlight innovative approaches and recent research advances in the numerical modelling of energy systems, providing attendees with insights into both theoretical developments and practical applications.

Key themes include demand and load matching for electricity and heat, thermal energy storage for both heating and cooling, and power-to-heat technologies that enable flexible energy use. Attention will also be given to distributed production and storage of electricity, which are central to the transition toward more resilient and decentralized energy systems. Through these topics, the session will explore how advanced computational methods contribute to improving energy management, enhancing system stability, and supporting the integration of renewable energy sources.

Specific topics of interest include but are not limited to heat and cold energy storage systems, storage of surplus electricity, district heating and cooling networks, circular and efficient use of energy, heat pump technologies, and the utilization of solar and geothermal resources. Furthermore, the session will address challenges in energy load and demand matching as well as energy use in buildings, which represent key areas for achieving energy efficiency and decarbonization goals.

Overall, the objective of this session is to provide a comprehensive overview of the current state of research and to foster discussion on future directions for modelling and simulation in sustainable energy systems. Researchers, engineers, and practitioners are encouraged to share their findings, methodologies, and perspectives on advancing energy system modelling.