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## MACHINE LEARNING FOR ENERGY MANAGEMENT IN SUSTAINABLE AND SMART COMPLEX ENERGY SYSTEMS

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As distributed energy resources (DERs) such as electric vehicles (EVs), energy storage systems (ESS), photovoltaics (PVs), and prosumers become more prevalent, the challenge of maintaining real-time demand and supply balance for central systems grows increasingly complex. This complexity is further intensified by the rapid advancements in emerging technologies, including the widespread adoption of AI and the global expansion of data centers.

Local energy markets and smart network services are emerging as promising solutions to decentralize and autonomously manage demand and supply at the local level, alleviating the burden on the central system without hindering the progress of these technologies. Consequently, there is a growing interest in exploring innovative market mechanisms and transactive energy management strategies to facilitate local energy trading and balancing. These mechanisms must also consider their impact on wholesale energy markets, traditional suppliers, generators, and network operators, while supporting the integration of large-scale renewable energy and demand response systems.

The evolving requirements of transactive energy management and energy markets necessitate the application of advanced machine learning and computational intelligence techniques. These tools are critical for addressing challenges ranging from energy disaggregation to distributed and large-scale energy management.

This special session aims to highlight the latest advancements in applying machine learning and computational intelligence to smart energy management and smart energy markets. Particular emphasis is placed on key sectors such as AI infrastructure and manufacturing, contributing to the overarching goal of achieving a net-zero society.