Special Session 18: AI and IoT Technologies for Enhancing Flexibility and Security in Net-Zero Energy Systems

Session Organizers：

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Brief Description of the Session Thematic:

Climate challenges are one of the most significant issues facing humanity today, and achieving net-zero energy systems (NZESs) is key to addressing this global concern. The rising artificial intelligence (AI) and Internet of Things (IoT) technologies brings new vitality into the development of intelligent NZESs. However, there remain challenges in terms of flexibility and security of NZESs. For instance, in the power system, maintaining real-time balance between supply and demand sides is critical. Therefore, it is necessary to fully exploit the potential of flexible resources such as hydrogen, heating, ventilation, and air conditioning (HVAC), electric vehicles (EVs), etc., so as to ensure sufficient flexibility. How to integrate various forms of flexible energy and resources using AI and IoT technologies in an efficient and comprehensive manner remains a significant research topic. On the other hand, as AI and IoT technologies become more widely applied, NZESs are evolving into deeply coupled cyber-physical systems, making them more susceptible to security threats. How to ensure the security of NZESs while implementing these advancing AI and IoT technologies is also a crucial research topic. This session will explore these opportunities and challenges, aiming to ensure more flexible and secure NZESs.

Topics and Keywords:

1. Smart integration of power, hydrogen, and other clean energy to form energy systems
2. Modeling of energy systems (including power system) considering AI/IoT technologies
3. Flexibility enhancement of energy systems using AI and IoT technologies
4. Optimization methods for planning and operation of AI-/IoT-enabled energy systems
5. Intelligent controls of AI-/IoT-enabled energy systems
6. Risk analysis and mitigation strategy in energy system decarbonization using AI/IoT technologies
7. Defense strategy to ensuring cyber-physical security of AI-/IoT-based energy systems