Speaker's Bio

Prof. Li Sun

(Keynote Speaker)

IEEE Senior Member

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Speech Title: The Role of Thermal Inertia in Improving the Flexibility of Power Grid with High Renewable Penetration

Biography:

Li Sun, IEEE Senior Member, received the PhD degree from Tsinghua University in 2017. He is currently the Youth Chair Professor in the School of Energy and Environment at Southeast University, Nanjing, China. He was a Visiting Associate Professor in Cornell University since 2019 to 2020. He is mainly engaged in the research of dynamics and control of energy systems with thermal and hydrogen components. He has led over 30 national and enterprise commissioned research projects with more than 20 million CNY, and authored 1 book and more than 120 referred journal papers with more than 5000 citations. He was listed in the Stanford's top 2% top scientists in the world. He is the Vice Chair of the Working Group of IEEE Standard P3464 and (guest) editors of renowned journals like Energy, Renewable Energy, and Control Engineering Practice. He was awarded the National-level Youth Talent Program in 2023 and Jiangsu Province Outstanding Young Scholars Fund. As the leading scientist, he won the First Prize of China Electric Power Science and Technology Award and the Second Prize of Jiangsu Province Science and Technology Progress Award, for contributions to the coordinated control of electricity and heat integrated energy systems.

Abstract: Thermal inertia widely exists in the power systems, such as the thermal power generation in the source side and the heat pump applications in the load side. These thermal inertia is usually caused by the slow dynamics of the temperature and pressure of working fluid such as water/steam, air or refrigerant within a limited volume. This talk will discuss the potential of utilizing the thermal inertia to help smooth the fluctuation of renewable energy and thus improve the flexibility of the power grid. However, the inertia of different thermal components exhibit different time-scale dynamics and requires cautious control design. This talk begins with the dynamic modelling and analysis methods. Several uncertainty compensation based control methods are proposed for different thermal processes, including Economic Model Predictive Control (EMPC) for the energy efficiency optimization of multivariable processes. To demonstrate the efficacy, some field applications of thermal inertia control are introduced in the cases like coal-fired power plant, building energy systems and cascaded heat pump systems for distributed steam generation in industry.

中文简历:

孙立，东南大学能源与环境学院青年首席教授，博士生导师，IEEE 高级会员，入选国家级青年人才工程、江苏省杰青。2017 年毕业于清华大学热能工程系，主要从事热工动态学和能源系统工程学科的研究，先后主持国家、省部级与企业委托研发项目 30 余项，出版专著 1 部，在中国工程院院刊 Engineering 及 IEEE 汇刊等知名期刊发表论文 100 余篇，他引 5000 余次，入选斯坦福全球前 2%顶尖科学家榜单。兼任 IEEE 标准 P3464 工作组副主席，兼任 Energy, Renewable Energy, 美国控制会议和中国电机工程学报等国内权威期刊/会议的编委或客座编委。相关成果应用于国家电网、南方电网和国家能源集团的多个电热耦合示范项目，牵头获得中国电力科学技术奖一等奖、江苏省科学技术进步奖二等奖各 1 项。