



北京大学
PEKING UNIVERSITY

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COOL RESEARCH 系列报告第二十四讲

Charting a Stable, Safe and Incentive Path Towards Green Energy Systems

Abstract: The global push for decarbonization and electrification is transforming power systems, enabling greater participation of distributed energy resources (DERs) and responsive loads in energy system operation. However, these advances introduce new challenges in system stability, user privacy, and operational security. This talk presents intelligent solutions to address each of these dimensions. First of all, phasing out conventional generators reduces rotating mechanical inertia and increases grid dynamics uncertainty, which renders power systems more prone to instability. This talk will show that, by smartly designing controllers for inverter-interface of renewables, one can shape the power grid response nicely so that the stability and performance of grid with high renewables can be guaranteed by simply checking decentralized criteria. Second, due to rising privacy concerns from customers, the system operator is unaware of individual preferences in energy usage, which obstructs system operators to achieve social welfare since, unlike dispatchable resources, customers often cannot be directly controlled. This talk will present an adaptive pricing framework that can incentivize customers to align individual benefits with social welfare without requiring personal data, enabling privacy-preserving coordination. Finally, while the control flexibility enabled by DERs and customer participation provides many benefits, it also opens a gateway for cyber-physical attacks in energy systems. Thus, the system operators must be careful about strategic attacks by hacking edge devices. This talk will present an efficient algorithm to identify the potential attack in future energy systems.



Speaker: 江彦 (香港中文大学 (深圳) 助理教授)

Biography: Yan Jiang is currently an Assistant Professor with the School of Science and Engineering at Chinese University of Hong Kong, Shenzhen, CHN. She received the B.Eng. degree in electrical engineering and automation from Harbin Institute of Technology, Harbin, CHN, in 2013, the M.S. degree in electrical engineering from Huazhong University of Science and Technology, Wuhan, CHN, in 2016, and the Ph.D. degree in electrical engineering with the M.S.E. degree in Applied Mathematics and Statistics from Johns Hopkins University, Baltimore, USA, in 2021. She was a Postdoctoral Scholar with the Department of Electrical and Computer Engineering at University of Washington, Seattle, USA, from 2021 to 2024. Her research interests lie in control, optimization, and learning with application to power systems.

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