**题目：**下一代智能电网：基于电力电子的自主电力系统

**时间:** 2014年12月29日10：00

**地点：**电信群楼3-308会议室

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**摘要：**在电力系统领域，智能电网已经谈了多年，问题都已经解决了吗？未来的路在何方？在控制和系统理论领域，经常听人说已经没路可走了，真是这样吗？在电力电子领域，好象除了碳化硅、氮化镓等宽禁带器件就不再有问题值得研究了，问题是有了器件用在哪里呢？今天的报告将从控制与系统理论的角度出发勾画下一代智能电网的蓝图并提出两条基于虚拟同步机的技术路线，阐述如何用常规同步电机的同步机制统一常规电源、新能源、电动汽车、储能系统以及大部分负荷接入电网的机制，实现电网的大统一和自主运行，从而展示控制、电力电子和电力系统三大学科的完美融合所带来的巨大研究和商业机会。

**个人简介：**钟庆昌教授是美国伊利诺理工学院(Illinois Institute of Technology，IIT)电气与计算机工程系的能源与电力首席教授(Max McGraw Endowed Chair Professor)，中国国家电网公司国家级特聘专家。是IEEE电力电子学会杰出讲员(Distingusihed Lecturer)，欧洲控制协会英国代表，劳斯莱斯大学技术联盟委员，*IEEE Trans. on Automatic Control, IEEE Trans. Power Electronics、IEEE Trans. Industrial Electronics、IEEE Trans. Control Systems Technology、European Journal of Control*和*IEEE Access*的编委，英国工程技术学会 (IET) Fellow, IEEE高级会员，国际自动控制联合会 (IFAC) 电力与能源系统技术委员会副主席，应邀在2013 IEEE PEDG, 2014 IEEE GreenTech等12个国际会议做主题报告，是世界上同时在控制与电力电子领域得到认可的少数专家之一。钟教授2000年获得上海交通大学自动化系控制理论与控制工程专业博士学位，2004年获得英国帝国理工控制与电力工程博士学位，六年后于2010年出任英国拉夫堡大学终身主任教授、控制与可靠性研究组主任，2012年任英国谢菲尔德大学控制与系统工程系终身主任教授。钟教授的主要研究方向包括电力系统、新能源与分布式发电、电力电子、智能电网、电动汽车、高速铁路供电与驱动系统、时间滞后系统、鲁棒控制理论、化工过程控制等相关领域。他主要解决了关于时间滞后系统鲁棒控制的一系列基础理论问题，将逆变器与同步发电机从数学上等价了起来，提出了同步逆变器的思想，是虚拟同步机的主要发明人，解决了新能源接入电网和逆变器并联运行的系列关键问题，提出了下一代智能电网的框架以实现电力系统的全自主运行，取得了一系列原创性的研究成果。他出版了三部英文专著：《新能源与智能电网接入中电力逆变器的控制》、《时间滞后系统的鲁棒控制》、《积分时滞系统的控制》。他的第四本英文专著《全自主电力系统---下一代智能电网》将于2015年由Wiley-IEEE出版社出版。

钟教授研究组正在招收博士生和访问学者，欢迎有意成为世界一流研究者的同仁报名。

**Title:** Next-Generation Smart Grids: Power Electronics-based Autonomous Power Systems

**Date:** Dec. 29, 2014

**Place:** Room 3-308, No.3 Building, Electronic and Electrical Engineering Department, Minhang Campus

**Speaker:** Prof. Qing-Chang Zhong, Illinois Institute of Technology, USA

**Abstract:** Power systems are going through a paradigm change from centralised generation, to distributed generation, and further on to smart grid. A large number of renewable energy sources, electric vehicles, energy storage systems etc. are being connected to power systems. Moreover, various loads/consumers are being required to take part in the regulation of power systems and to improve energy efficiency. These make it impossible to manage power systems in the way that has been (is being) done, simply because of the huge number of players in the system. In this talk, an architecture for the next generation smart grids is presented to tackle this challenge and a technical route to achieve this is demonstrated. This standardizes the interface of all electrical supplies, including conventional power plants and new add-ons, such as wind/solar farms, electrical vehicles and energy storage systems, and a majority of loads with the transmission and distribution networks, by exploiting the synchronisation principle of synchronous machines. This architecture opens the prospect of achieving completely autonomous operation of power systems. As a result, the communication and information layer of smart grid can be released from the low-level control.

**Biosketch**: Dr. Qing-Chang Zhong is the McGraw Endowed Chair Professor in Energy and Power Engineering at Dept. of Electrical and Computer Engineering, Illinois Institute of Technology, Chicago, USA, and a Specialist recognised by the State Grid Corporation of China (SGCC). He is a Distinguished Lecturer of IEEE Power Electronics Society and the UK Representative to European Control Association. He also serves on the Rolls-Royce University Technology Partnership (UTP) Board in Power Electronics Systems. He obtained a PhD degree in 2000 from Shanghai Jiao-Tong University and another PhD degree in 2004 from Imperial College London (awarded the Best Doctoral Thesis Prize). He (co-)authored three research monographs, including Robust Control of Time-delay Systems (Springer, 2006) and a No 7 Amazon Best Seller Control of Power Inverters in Renewable Energy and Smart Grid Integration (Wiley-IEEE Press, 2013). He proposed the architecture for next-generation smart grids, which is now widely reported on Smartgrid.IEEE.org, Spectrum.IEEE.org, SmartGridNews.com and the US Science News Radio Network. His fourth book on Next Generation of Smart Grids will be published by Wiley-IEEE in 2015. He is an Associate Editor for *IEEE Trans. on Power Electronics, IEEE Trans. on Industrial Electronics, IEEE Trans. on Automatic Control, IEEE Trans. on Control Systems Technology, IEEE Access and European Journal of Control*. His research focuses on power electronics, advanced control theory and the integration of both, together with applications in renewable energy, microgrids, smart grid integration etc. He is a Fellow of IET, and was a Senior Research Fellow of Royal Academy of Engineering and a member of the Scientific Advisory Board of US NSF FREEDM Systems Center at North Carolina State University.