

**UNIVERSITY OF MACAU**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

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## **Trend of the Smart Grid Development**

by

**Prof. Wei Jun LEE**

*Professor and Director Energy Systems Research Center,  
The University of Texas at Arlington, Texas, USA*

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### **ABSTRACT**

The electrical power system in the US has been named as "the supreme engineering achievement of the 20th century" by the National Academy of Sciences. While the power system is a technological marvel, it is also reaching the limit of its ability to meet the nation's electricity needs. In addition, our nation is moving into the digital information age that demands higher reliability from the nation's aging electrical delivery system.

The modernization of the electricity infrastructure leads to the concept of "smart grid". A comprehensive smart grid design should cover both top-down and bottom-up approaches. For the current centralized generation and transmission system, upgrading the power delivery infrastructure, enforcing the system security requirement, and increasing interoperability are well known techniques to improve the reliability and the controllability of the power system. For the bottom-up approach, one of the most important features is its ability to support a more diverse and complex network of energy technologies. Specifically, it will be able to seamlessly integrate an array of locally installed, distributed power sources with smaller CO<sub>2</sub> footprint, such as fuel cells, photovoltaic, and wind generation, into the power system.

This presentation discusses the opportunities and challenges for the development of Smart Grid, highlights the smart grid related researches and developments. The presentation concludes with the listing of issues needed to be addressed to ensure successful integration procedures that will eventually create new structures of efficient, modular and environmentally responsive electricity infrastructure that will have an impact nationally as well as globally.



## **BIOGRAPHY**

Wei-Jen Lee received the B.S. and M.S. degrees from National Taiwan University, Taipei, Taiwan, R.O.C., and the Ph.D. degree from the University of Texas, Arlington, in 1978, 1980, and 1985, respectively, all in Electrical Engineering.

In 1985, he joined the University of Texas at Arlington, where he is currently a professor of the Electrical Engineering Department and the director of the Energy Systems Research Center.

He has been involved in the revision of IEEE Std. 141, 339, 551, 739, and dot 3000 series development. He is the Chair of the IEEE/IAS, Industrial & Commercial Power Systems Department (ICPSD), associate editor of IEEE/IAS and guest editor of IEEE Transactions on Smart Grid. He is the project manager of IEEE/NFPA Collaborative Research Project on Arc Flash Phenomena.

Prof. Lee has been involved in research on utility deregulation, renewable energy, smart grid, microgrid, arc flash and electrical safety, load forecasting, power quality, distribution automation and demand side management, power systems analysis, online real time equipment diagnostic and prognostic system, and microcomputer based instrument for power systems monitoring, measurement, control, and protection. He has served as the primary investigator (PI) or Co-PI of over ninety funded research projects. He has published more than three hundred and twenty journal papers and conference proceedings. He has provided on-site training courses for power engineers in Panama, China, Taiwan, Korea, Saudi Arabia, Thailand, and Singapore. He has refereed numerous technical papers for IEEE, IET, and other professional organizations.

Prof. Lee is a Fellow of IEEE and registered Professional Engineer in the State of Texas.

**ALL ARE WELCOME!**