Special Session 14
Uncertainty Handling Techniques for Smart Grid

Session Chair:
Hao Quan, Nanjing University of Science and Technology, quanhao@njust.edu.cn
Session Co-Chair:
Anurag Sharma, Newcastle University in Singapore, Anurag.Sharma@newcastle.ac.uk

Scope of the Session:
Smart grid, as an advanced version of a present power grid, is facing uncertainties on both the generation and demand side. The complexity and level of uncertainty present in operation of power systems have significantly grown due to penetration of renewable resources. Renewable energy resources, such as wind and solar power, are intermittent and volatile by nature. These uncertainties have brought great challenges on system operation, control, stability and reliability. In addition, uncertainty also increases in the distribution network with the introduction of electric vehicles and demand response. The challenge increases further when you have a more decentralized system structure and bi-directional power flow. Therefore, uncertainty management becomes important to ensure supply and demand balance and maintain the quality of power supply at the same time.
One of the chief challenges for smart grid application scenarios will be uncertainty handling and incorporating the uncertainty into decision-making process. In this respect, different uncertainty handling techniques such as probabilistic forecasting, stochastic programming, fuzzy logic systems, robust optimization and other combined solutions with artificial intelligence can significantly contribute to solve problems in smart grid.
This special session will bring together researchers and developers from academia, industry and governmental sectors to share and exchange novel ideas, explore the inherent challenges in developing future smart grids, investigate novel designs, explore enabling technologies and share relevant experiences on uncertainty handling techniques in smart grid and its applications.
Topics for the session include, but are not limited to:

- Probabilistic forecasting techniques, i.e. interval, quantile or probability density forecasting etc.
- Micro grids, clean & renewable energy resources and their integration
- Load, wind and solar power forecasting
- Self-healing networks, power flow management and voltage control
- Neural networks and deep learning techniques
- Fuzzy logic system for uncertainty management
- Robust optimization and its application in smart grids
- MILP and stochastic programming
- Demand side management, optimization and uncertainty of electrical vehicles
- Applications of computational intelligent techniques for power system
- Data management and grid analytics
- Energy management system, optimization and electricity markets
- Intelligent multi-agent system and IoT for power engineering