Computational Intelligence
Methods and Applications in Smart Grid

Special Session Organizer:
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Ganesh Kumar Venayagamoorthy (S’91-M’97-SM’02) received his Ph.D. degree in electrical engineering from the University of Natal, Durban, South Africa, in Feb. 2002. He is the Duke Energy Distinguished Professor of Electrical and Computer Engineering, and the Founder and Director of the Real-Time Power and Intelligent Systems (RTPIS) Laboratory at Clemson University. Prior to that, he was a Professor of Electrical and Computer Engineering at Missouri S&T. He was a Visiting Researcher with ABB Corporate Research, Vasteras, Sweden, in 2007. His research interests are in the development of advanced computational methods and algorithms for real-world applications, including power systems stability and control, smart grid applications, sensor networks and signal processing. He has published 2 edited books, 6 book chapters, and over 95 refereed journals papers and 300 refereed conference proceeding papers. Dr. Venayagamoorthy is a recipient of several awards, including a 2007 US Office of Naval Research Young Investigator Program Award, a 2004 US National Science Foundation CAREER Award, the 2010 Innovation Award from the Academy of Science of St. Louis, the 2006 IEEE Power Engineering Society Walter Fee Outstanding Young Engineer Award, and the 2003 International Neural Network Society (INNS) Young Investigator Award. He is a Fellow of the Institution of Engineering and Technology (IET), UK and the South African Institute of Electrical Engineers, a Senior Member of INNS, and a Member of the American Society for Engineering Education and the INNS Board of Governors. He is a current editorial board member of the new IEEE Transactions on Smart Grid and the IEEE Transactions on Evolutionary Computation.

Introduction to the special session:
The new constraints placed by the environmental and economic factors and by the availability of energy resources will bring critical challenges to electric energy security, reliability and sustainability in smart grid and micro-grids. These challenges require innovative solutions. This special session will focus on the applications of computational intelligence (CI) for planning, implementation, operation, control, and optimization of smart grid and micro-grids, in order to provide better electric energy security, reliability and sustainability as well as efficiency. The CI techniques include neural networks, fuzzy logic, evolutionary, approximate dynamic programming, multivariate polynomial model, machine learning, adaptive signal processing, pattern recognition, data mining, on-chip learning, biologically inspired computing, multi-agent systems, etc.

The objective of this special session is to bring together the researchers in the fields of
computational intelligence and electric power and energy systems (including power electronics devices and systems) from all around the world and to present the latest technology improvement. The special session invites contributions in the areas including, but not limited to, the following:

- Computational intelligence paradigms and methods
- Condition monitoring, and fault diagnostics and prognostics
- Control room visualizations
- Demand response control
- Distributed generations and resources
- Electric vehicles including plug-ins
- Energy storages
- Energy management systems and demand responses (DRs)
- Equivalent system models
- FACTS devices and HVDC
- Fault analysis
- Grid interfacing topologies and control techniques for power electronics converters in distributed power grid
- Load/price forecasting and power market
- Load management
- Micro-grid modeling, dynamics, and hierarchical control
- Protection coordination and design
- Power quality
- Power system stability and control
- Renewable energy systems: wind energy, solar energy, fuel cells, etc.
- Smart grid security
- Smart grid optimization
- Synchronphasor Applications
- Stability assessment
- Wide area monitoring and control systems

**Keywords**
Computational Intelligence, Micro-grid, Power Systems, Power Electronics and Smart Grid