Professor Ganesh Kumar Venayagamoorthy (gkumar@ieee.org)

Dr. Ganesh Kumar Venayagamoorthy is the Duke Energy Distinguished Professor of Power Engineering and Professor of Electrical and Computer Engineering at Clemson University since January 2012. Prior to that, he was a Professor of Electrical and Computer Engineering at the Missouri University of Science and Technology, Rolla, USA (2002 to 2011), and a Senior Lecturer in Department of Electronic Engineering, Durban University of Technology (DUT), Durban, South Africa (1996 to 2002). Professor Venayagamoorthy is the Founder (2004) and Director of the Real-Time Power and Intelligent Systems Laboratory. Professor Venayagamoorthy received his PhD and MScEng degrees in Electrical Engineering from the University of Natal, Durban, South Africa. He received his BEng degree with a First-Class Honors in Electrical and Electronics Engineering from Abubakar Tafawa Balewa University, Bauchi, Nigeria. He holds an MBA degree in Entrepreneurship and Innovation from Clemson University.

In the last 30 years, Professor Venayagamoorthy's research has primarily emphasized the development and implementation of advanced computational methods and artificial intelligence based algorithms for smart grid applications (e.g. nonlinear modeling and control of power systems, power system optimization, predictions and forecasting of wind and solar energies, energy management systems, wide area monitoring and control systems, dynamic optimal power flow, electric vehicles, micro-grid systems, demand-response management). He has developed situational awareness and intelligence tools based on synchrophasor data for electric power control center operations and management. Professor Venayagamoorthy is the pioneer in the development and implementation of adaptive and optimal neuroidentifiers and neurocontrollers for power systems. Indirect adaptive control and adaptive critics based optimal controllers have been implemented to control synchronous generators under normal operating conditions and disturbances on actual micro-machines. The adaptive critic control framework has been extended to other smart grid applications including FACTS control, wide area control systems, PV energy management systems, wind farm control, and electric vehicle-to-grid (V2G) transactions. Professor Venayagamoorthy has demonstrated that distributed SmartParks (plug-in vehicles/electric vehicles parking lots) can be used as virtual FACTS devices and grid shock absorbers (damp oscillations), and with intelligent control can mitigate power system oscillations caused by dynamic operation of wind farms and system disturbances. Professor Venayagamoorthy is an inventor of technologies for scalable computational intelligence for complex systems, energy management systems, and dynamic stochastic optimal power flow.

Professor Venayagamoorthy is a 2004 US NSF CAREER Awardee, a 2007 US Office of the Naval Research (ONR) Young Investigator Program (YIP) Awardee, and a 2008 NSF Emerging Frontiers in Research and Innovation (EFRI) Awardee. He led the brain2grid project funded by the US National Science Foundation (NSF). He has published over 550 refereed technical articles which are cited ~ 24,000 times with a *h*-index of 70 and i10-index of over 300. Professor Venayagamoorthy has given over 500 invited technical presentations including keynotes and plenaries in over 40 countries to date. He has provided research guidance and/or mentoring to over 150 graduate and undergraduate students and post-doctoral fellows.

Professor Venayagamoorthy is involved in the leadership and organization of conferences including the Clemson University Power System Conference and Pioneer and Chair/co-Chair of the IEEE Symposium of Computational Intelligence Applications in Smart Grid since 2011. He is currently the Chair of the IEEE PES Working Group on Intelligent Control Systems, and the Founder and Chair of IEEE Computational Intelligence Society (CIS) Task Force on Smart Grid. He has served/serves as Editor/Associate Editor/Guest Editor of several IEEE Transactions and Elsevier Journals. He is the Editor for the IEEE Press Series on Power and Energy Systems. Professor Venayagamoorthy has organized and chaired many IEEE IAS Annual Meeting sessions over the years. He has chaired many IEEE technical committees/subcommittees.

Professor Venayagamoorthy has received several awards for faculty, research and teaching excellence from universities, professional societies, and organizations including paper awards from the IEEE IAS Industrial Automation and Control Committee, 2007 IAS Small Outstanding Chapter Award (St. Louis Chapter) and 2005 IEEE Industry Application Society's Outstanding Young Member Award. Professor Venayagamoorthy is a Fellow of the IEEE, South African Institute of Electrical Engineers (SAIEE), IET (UK), and Asia-Pacific Artificial Intelligence Association (AAIA), and a Senior Member of the International Neural Network Society (INNS) and Vice-President for Industry Relation of the INNS.

Lecture Topics

Topic 1: Artificial Intelligence in the Future of Smart Grids (AI-Smart Grid)

Abstract: The modern electric power and energy system, referred to as the 'smart grid' is complex and one that is expected to be conscious, intelligent, distributed, and flexible. Such an electric power system architecture can facilitate secure and distributed flow of power from renewable energy sources including solar and wind. Furthermore, it can handle flexible loads and energy storage including electric vehicles. This talk will address the potential and promises of Artificial Intelligence (AI) and intelligent systems for smart grid operations and control.

Topic 2: Demand Response Management with Distributed Energy Resources (DRM-DERs)

Abstract: With the high proliferation of distributed energy resources including solar power and EVs, curtailments and higher capacity reserves are required for a reliable power system operation. Electric utilities can leverage predictions to issue demand request (DR) requests considering resource adequacy and operational costs. Consumers can be formed as virtually connected communities, and aggregators can facilitate electric utilities by providing situational intelligence and distributing DR requests among consumers. Advances in DR management frameworks for the grid of the future will be presented.

Topic 3: Internet of Things in Power and Energy Systems

Abstract: A transformation is underway in electric power and energy systems (EPESs) to provide clean distributed energy for sustainable global economic growth. Internet of Things (IoT) is at the forefront of this transformation imparting capabilities, such as real-time monitoring, situational awareness and intelligence, control, and cyber security to transform the existing EPES into intelligent cyber-enabled EPES, which is more efficient, secure, reliable, resilient, and sustainable. This talk will provide an assessment of the role, impact, and challenges of IoT in transforming EPESs.