

Future Electrical Power Networks: Challenges and Solution on System's Frequency

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1. Abstract

Future power networks face several challenges: (i) liberalized markets and increased cross-border bulk power transfers to facilitate effectiveness of market mechanisms, (ii) massive penetration levels of renewable energy from highly variable generators and energy storage systems, both connected to the system using high power converters, (iii) enormous deployment of high power electronic devices (multi-terminal HVDC, FACTS, Active shunt and series compensations, etc.), (iv) colossal deployment of intelligent devices, meters, etc., and densely integrated ICT infrastructures and other more challenges... Most of them have an element in common, high power converters that decouple the new energy sources from the pre-existent ac power systems. During a system frequency disturbance the generation/demand power balance is lost, the system frequency will change at a rate initially determined by the total system inertia. However, future power systems will increase the installed power capacity (MVA) but the effective system inertial response will stay the same nowadays, this is because the new generation units based on power converters creates a decoupling effect of the real inertia and the ac grid. The result is deeper frequency excursions of system disturbances. A considerable reduction in the ability to overcome system frequency's disturbances is expected, the inertia response may be decreased. The aim of this workshop is to present a general overview fundamental aspects about system frequency control and inertial response schemes for the future power networks.

2. Seminar Duration

60 minutes

3. Audience:

Undergraduate and postgraduate students, researcher and academic staff with special frequency and control of future energy networks.

3. Instructor Affiliation

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5. Instructor Biography



Francisco M. Gonzalez-Longatt is currently a Lecturer in Electrical Power System at Electrical Power System en School of Electronic, Electrical and Systems Engineering en Loughborough University. His academic qualifications include first Class Electrical Engineering of Instituto Universitario Politécnico de la Fuerza Armada Nacional, Venezuela (1994), Master of Business Administration (Honors) of Universidad Bicentennial de Aragua, Venezuela (1999) and PhD in Electrical Power Engineering from the Universidad Central de Venezuela (2008). He is former associate professor (1995-2009) and Chair (1999-2001) of the Department of Electrical Engineering of Universidad Nacional Politécnico de la Fuerza Armada Nacional, Venezuela (1995-2009). He is a former academic staff of Department of Aerospace, Electrical and Electronic Engineering at University of Coventry where he started as Lecturer in Electrical Engineering in 2012 and promoted to Senior Lecturer in Electrical Engineering in

2013. He was formerly with the School of Electrical and Electronic Engineering, The University of Manchester as Postdoctoral Research Associate (2009-2011).

He is the author or editor of several books (Spanish and English) including editor of the book "*Power Factory Applications for Power System Analysis*", Springer (2014), and He has written 9 book chapters, 10+ journal and magazine papers and 60+ conference papers. His work has over +370 citations and he has been the keynote speaker a several conferences. He was the session chair at [IECON 2013](#), [IEEE Powertech 2011](#), [IEEE ISGT Europe 2011](#), etc. He is a reviewer of the top conferences (PSCC 2014, IEEE PES GM 2013, IECON 2013, etc.) and journal papers research area (IEEE Transaction on Power Systems, IEEE Transaction on Smart Grids, IET Renewable Power Generation, Elsevier Renewable Energy, etc.)

He is Vice-President of *Venezuelan Wind Energy Association*, Senior Member of the Institute of Electrical and Electronic Engineering (IEEE), member of *The Institution of Engineering and Technology - The IET (UK)* and member of *International Council on Large Electric Systems -CIGRE*. He received the professional recognition as FHEA – Fellow of the Higher Education Academy in January 2014.

His research interest includes innovative (operation/control) schemes to optimize the performance of future energy systems. His research is or has been supported by *Royal Society –UK*. Two special research projects financially supported by the Royal Society deserve mention: "*Smart Multi-Terminal DC Micro-grids for autonomous Zero-Net Energy Buildings*" and "*Exploring beyond the Frontiers to Build a Smarter Grid (EBF2BSG)*".