

WORKSHOP

Massive Integration of Offshore Wind Power using High Voltage Direct Current (HVDC) Systems

1. Abstract

Use of high voltages (HV) is the key to efficient transmission and distribution of electrical power. The objective of this seminar is to provide an overview about the basic concepts used on *High Voltage Direct Current* (HVDC) system and its use to integrate offshore wind power into the classical power systems. Special emphasis would be given on linking the theoretical concepts with the practical applications. HVDC is often a preferred technology for overhead power transmission over long distances and underground cables for relatively shorter distances. A bulk of the new offshore transmission infrastructure in the UK and worldwide is envisaged to be employing HVDC. In this context, the first part of the seminar on 'Integration of Offshore Wind Power using HVDC Systems' would give an introduction to the HVDC technology; its advantages (and disadvantage) over conventional AC transmission; operation and control of HVDC and its interaction with the existing AC transmission network. Emerging technologies through use of voltage source converters would be covered. The second half of the seminar on 'Wind power and HVDC Transmission Systems' would outline the benefits of using DC transmission to integrate wind power into the classical AC power systems.

2. Outline

- I. Introduction into HVDC Systems
- II. HVDC Technologies
- III. Components of an HVDC Transmission System
- IV. HVDC Control Systems
- V. Wind Power Technologies
- V. Integration of Wind Power Technologies Using HVDC

3. Tutorial Duration

Three hour.

4. Instructor Affiliation

Francisco M. Gonzalez-Longatt, PhD, SMIEEE, MIET
Lecturer in Electrical Engineering
Coventry University
Faculty of Engineering and Computing
Department of Aerospace, Electrical and Electronic Engineering
Armstrong-Siddeley Building, AS410
Priory Street, Coventry, CV1 5FB
United Kingdom
Personal Webpage: <http://www.fglongatt.org.ve>
Phone: +44 779 5634298
Email: fglongatt@ieee.org

Vice-President
Venezuelan Wind Energy Association
Webpage: <http://www.aveol.org.ve>
Email: fglongatt@aveol.org.ve

5. Instructor Biography

Francisco M. Gonzalez-Longatt is currently a Lecturer in Electrical Engineering in the Faculty of Engineering and Computing, University of Coventry and he is Vice-President of Venezuelan Wind Energy Association. 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 on Electrical engineering Department of Universidad Nacional Politécnico de la Fuerza Armada Nacional, Venezuela (1995-2009). He was formerly with the School of Electrical and Electronic Engineering, The University of Manchester as Postdoctoral Research Associate (2009-2011). His main area of interest is integration of intermittent renewable energy resources into future power system and smart grids.

6. List of Relevant Publications in this Area by the Instructor:

- [1] **F. Gonzalez-Longatt**, J.M. Roldan. "Effects of DC Voltage Control Strategies on Voltage Response on Multi-Terminal HVDC Following a Disturbance". 47th International Universities' Power Engineering Conference (UPEC 2012). London, UK. 4-7 September 2012.
- [2] **F. Gonzalez-Longatt**. "Solution of AC/DC Power Flow on a Multi-Terminal HVDC System: Illustrative Case Supergrid Phase I". 47th International Universities' Power Engineering Conference (UPEC 2012). London, UK. 4-7 September 2012.
- [3] **F. Gonzalez-Longatt**, J. Roldan and C. Charalambous. "Power Flow Solution on Multi-Terminal HVDC Systems: Supergid Case". International Conference on Renewable Energies and Power Quality (ICREPQ'12). Santiago de Compostela (Spain), 28th to 30th March, 2012.
- [4] **F. Gonzalez-Longatt**, J. Roldan, M. Burgos-Payán, V. Terzija. "Implications of the DC Voltage Control Strategy on the Dynamic Behavior of Multi-terminal HVDC following a Converter Outage". UK and European T&D Network Solutions to the challenge of increasing level of renewable generation. Newcastle-under-Lyme, Staffordshire UK, March 14-15, 2012.