

Practical Training

Renewable Energy Sources Integration using DIGSILENT PowerFactory (Basic V15): Generic Model

Santiago de Chile-Chile

11th-12th July 2013

1. Introduction

The planning, design, and operation of power systems require properly-conceived and adequately-conducted studies in order to evaluate existing and proposed system performance, reliability, safety, and economics. These studies are a powerful cost-effective way to prevent surprises and to optimize equipment selection. System's studies at design stage allow identifying and avoiding potential deficiencies in the system before it goes into operation. Studies help locate the cause of equipment failure and disoperation, and determine corrective measures for improving system performance in existing systems. Renewable energy resources (RES) have behaviour considerably different to the classical electro-mechanical generators, as consequence, the integration of RES impacts every single aspect on the planning, design, and operation of power systems. Carefully designed models must be used for simulations of RES and very different approached must be to establish the actual impact on the power system behaviour and to define required improvement to match system operation requirements.

DIGSILENT PowerFactory is widely used power system simulation software. It is capable of simulating from short term transient stability to long term control design situations and it is used in transmission and distribution networks, industry, wind farms, PV systems and smart grids. There are several new features on the most recent version of PowerFactory. Version 14.1 made available a new global "Templates" library (Library\Templates\) that contains "ready for use" models. This global templates library contains the following "ready for use" models: Double Fed Induction Wind Turbine Generator, Fully Rated Converter Wind Turbine Generator, Photovoltaic Systems and Battery Energy Storing System.

Brilliant power engineers working on operation, planning and control of power system including RES must take advantages of the new features of template library in PowerFactory 14.1 and maximize its use in integration studies. This practical trained is designed to provide a comprehensive overview about the generic models included into the Templates Library in DIGSILENT PowerFactory 15.0 and their use in the main power system integration studies.

2. Objective:

This practical training is designed for two general objectives:

1. To provide a thorough and comprehensive overview of the most important aspects for modelling and simulation of RES for the generic models included in the Templates Library of PowerFactory 15.0.
2. To use the generic models included in the Templates Library of PowerFactory 15.0 for the main power system integration studies using DIGSILENT.

3. Indicative Content:

The topics to be covered during the seminar include:

- Introduction to modelling and simulation of RES
- Introduction to integration studies, grid code requirements
- General overview of Wind Energy and Photovoltaic
- Generator concepts in PowerFactory
- Short circuit analysis considering RES
- Introduction to time-domain simulations in power system –Stability function, RMS simulations-
- Overview of the generic models, model description, Template library description, Template structure, model's parameters, customization of the model, running simulations: Load flow, Short circuit and Dynamic simulation (RMS):
 - Wind turbine generator (WTG) with fully rated converter
 - Doubly Feed Induction Generator (DFIG)-WTG
 - Generic Photovoltaic (PV) model.
 - Battery Energy Storage System

3. Pre-requisites:

- A basic mathematical understanding of load-flow studies and fault calculations and very good mathematical knowledge of the basic techniques used on control system design.
- Good understanding of dynamic processes in power systems, previous experiences in time-domain simulations is desired.
- Participants should be familiar with the general handling of the PowerFactory software: Load flow and Short-circuit calculation with PowerFactory.
- Background experience through the use of DigSILENT PowerFactory - this will greatly enhance the participants; the handling of the RMS-simulations is highly desired.
- Knowledge of DSL modelling is not required but it can be helpful.

4. Duration:

This seminar is designed for duration of 2 days, considering 8 hours per day.

5. Location:

Universidad de Santiago de Chile, DIE-Usach, Av. Ecuador 3519, Estación Central, Santiago de Chile, Chile.

6. Audience:

- Postgraduate students
- Utility engineers
- System operators
- Maintenance staff
- RES producers
- Consultants and researchers on RES.

7. Instructor Affiliation

Francisco M. Gonzalez-Longatt, PhD, SMIEEE, MIET, MCIGRE
Lecturer in Electrical Engineering
Coventry University
Faculty of Engineering and Computing
Department of Aerospace, Electrical and Electronic Engineering
Engineering and Computing Building, EC3-32
Priory Street, Coventry, CV1 5FB
United Kingdom
Personal Webpage: <http://www.fglongatt.org>
Phone: +44 779 5634298
Email: fglongatt@fglongatt.org

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

8. 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 Bicentenario 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. More details: www.fglongatt.org.

9. Contact:

Contact person at Santiago de Chile: Dr Humberto Verdejo

humberto.verdejo@usach.cl

Webpage: <http://www.fglongatt.org>

10. Sponsors



Departamento de Ingeniería Eléctrica
Universidad de Santiago de Chile
Santiago de Chile, Chile



Transelec. Red de Estudios de Transmisión
Santiago de Chile