POWERFACTORY

Introduction to Renewable Energy Generation Analysis

Course Content

DIgsilent Buyisa (Pty) Ltd

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

Introduction to Renewable Energy Generation Analysis

2 Day Course

Objective:
The objective of the course is to provide users of PowerFactory with the relevant knowledge to effectively analyse renewable energy generation sources and the integration of such sources into the electrical network.

NOTE: The course does NOT cover detailed modelling aspects of RE generators, their associated controllers and dynamic analysis of such generation.

Pre-requisites:
- **MUST have attended the PowerFactory Basic course.**
- A good working knowledge of the basic techniques used in PowerFactory.

No of participants:
In-house at Customer premises: Minimum: 6; Maximum: 12.
At Digsilent Buyisa Training Centre: Minimum: 10; Maximum 16.
Online: Minimum 6; Maximum x16.

ECSA CPD Accredited and Points:
- The course is fully accredited with the Engineering Council of South Africa (ECSA).
- 2 CPD points for completion.

Who Should Attend:
The course is intended for
- Utility engineers
- Power system operators
- Project Developers
- Manufacturers
- Consultants and electrical engineers

Digsilent Buyisa
The Greens Office Park, Arabella Building
26 Charles De Gaulle Crescent, Highveld, Centurion, 0157

Telephone: +27 (0)87 351 6159
Email: info@digsilent.co.za
URL: https://www.digsilent.co.za

PRICE PER PARTICIPANT:

- For course pricing, kindly visit our website at: https://digsilent.co.za/training-courses/
- For in house prices @ customer premises: contact Digsilent for a quote via email info@digsilent.co.za or Telephonically (+27) 087 351 6159.

  - ❖ Prices are exclusive of VAT
  - ❖ Please note that cost excludes your Company's internal administrative costs.
  - ❖ All prices may change without prior notice - please contact Digsilent Buyisa for the latest prices before booking.
  - ❖ **DISCOUNT** is offered if a company sends more than one delegate per course.
  - ❖ Trainings held at Digsilent Buyisa Training Centre includes light breakfast snack, lunch and refreshments.

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Training schedule

DAY 1

08:30	**Wind Energy Basics and Turbine Generator Concepts** Fundamental wind power theory. Historical developments and modelling of wind generators. **Exercise 1: Modelling a DFIG Wind farm** Setting up a 25 MW wind farm which uses DFIG wind turbine technology.
10:30	**Tea/Coffee break**
11:00	**Solar Energy** Historical development of solar power. Physics of solar energy conversion and modelling solar farms (CSP, PV) **Exercise 2: Modelling a PV farm** Setting up a 15 MVA PV farm
12:30	**Lunch break**
13:30	**Other sources of renewable energy generators** Fundamentals and modelling of other RE generation sources (Hydro, biomass, fuel cells, geothermal and gas turbines) **Data Requirements and Studies -GRID CODE** Overview of grid code requirements specified for renewable generation. **Analysis of RE Generation – Reactive Power Requirements** Generator reactive limits, Grid code requirements
14:30	**Exercise 3.1: Reactive Power Limit of Generators** Create capability curves for generators and assess the reactive power capability.
15:00	**Tea/Coffee break**

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15:30 **Exercise 3.2: Reactive Power Capability of Wind Farm – Q Control**
Creating capability curves for generators and assessing the reactive power capability against the grid code requirements when under Q control operation mode

16:00 **Exercise 3.3: PV Farm -Voltage Control**
Assessing voltage control capability of the PV Farm against grid code requirements

16:30 **End of the first day**

DAY 2

08:30 **Steady State Analysis**
Typical studies considered: load flow, contingency analysis, losses, rapid voltage change, fault level contribution and power quality.

Exercise 4.1: Load flow Analysis
Load flow analysis of PV farm using operation scenarios.

09:00 **Contingency Analysis**
An overview of contingency analysis that can be used to determine power transfer margins and identify risks of changing load conditions.

Network Losses and Rapid Voltage Change
Assessing losses within electrical networks. Overview of various recommendations for rapid voltage change levels. Studying rapid voltage change in PowerFactory.

Exercise 4.2: Rapid Voltage Change
Assessing the rapid voltage change of the PV Farm under different operation scenarios.

10:30 **Tea/Coffee break**

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11:00	**Calculation of Short Circuit Contribution by RE Generators** Fault Levels / Short Circuit contribution of WTGs Short Circuit Calculation methods in PowerFactory **Exercise 5.1: Short Circuit Contribution of RE Farms- Wind farm with DFIG** Calculate the 3-phase and single-phase fault levels different short circuit calculation methods at the point of connection of a Wind farm with DFIG.
12:30	**Lunch break**
13:30	**Exercise 5.2: Short Circuit Contribution of RE Farms- PV Farm Contribution** Calculate the 3-phase and single-phase fault levels different short circuit calculation methods at the point of connection of a PV farm
14:00	**Power Quality Assessment** Fundamentals. Harmonic Load flow according to IEC 61000-3-6. Overview of the calculation procedure. Definition of harmonic sources in PowerFactory. Voltage flicker assessment according to IEC 61400-21. Power Quality Grid code requirements. **Exercise 6.1: Harmonic Load Flow** Evaluate the power quality of a wind farm according to IEC 61400-21. Calculation of the voltage distortion due to harmonics, the relative change in voltage due to switching operations in the wind farm.
15:00	**Coffee break**
15:30	**Exercise 6.2: Frequency Sweep** Setting up and executing a frequency sweep
16:30	**End of the second day**

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