

TECHNICAL ENGINEERING COURSES

Distributed Generation

Power Quality Assessment

Grounding of Distribution Systems

And More...

Distributed Generation and System Interface Issues

Introduction

Distributed Generators are installed, mostly, in distribution systems by Electrical Utilities, Industrial Customers and Independent Producers. Distributed Generation enables the utilization of renewable energy sources as well as combining electricity generation with industrial need for process steam in cogeneration plants for better economy. Use of Distributed Generation by electrical utilities allows deferring investment in new transmission and distribution infrastructures.

The use of Distributed Generation in power networks is not a problem-free process. Interfacing DG units with power systems involves implications on the structure and operating procedures of both the units and the system in which they are imbedded. The main concerns focus on operating procedures, control systems, islanding, and safety issues. The impact of DG presence in the network increases with the degree of penetration of these units in the system.

This course discusses the current status of DG in present power systems and the anticipated increase of their use in the near and not so near future. Different types of DG will be investigated while focusing on their application and functionality in power systems. The effect of DG on power quality, protection systems as well as islanding operation and detection will be examined.

What you will learn

This course focuses on:

- Introducing the participants to different aspects of DG technology.
- Investigating different interfacing configurations and examining applicable standards.
- Understanding the impact of DG on power quality and protection system requirements.
- Learning how to benefit from the presence of DG, and proper system interface, in order to enhance power quality levels.
- Introducing modeling and simulation techniques, using case studies, to demonstrate different issues involved in the integration of a DG plant into a simple distribution system.

Audience

- Power system planning and asset management engineers.
- Distribution system planning, operation and maintenance engineers.
- Distribution system protection and control engineers.
- Independent producers' and industrial firms' contemplating investing in DG plants; their technical advisors, prospective designers and operators of these plants.

Course Language:

English

Duration:

2 days

Instructor:

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Course Outline

Day 1

DG technologies

- Definitions of DG systems
- The current status of power systems
 - Structure of conventional power systems
 - Backup systems
 - The restructuring of power systems
- State-of-the-art DG technologies
- Technical and economical aspects of DG
- DG types
 - Non-renewable types (theory, rating, operations, industrial links, and cost)
 - Reciprocating engine generator sets
 - Fuel cells
 - Micro-turbines
 - Hybrid fuel cells/Micro-turbines
 - Renewable types (theory, rating, operations, links, and cost)
 - Wind energy
 - Photovoltaic
 - Solar energy
 - Biogas
- DG interfacing and applicable standards
 - Static power electronic converters based DG
 - Rotating machines based DG
- IEEE 1547 National Standard for Interconnecting distributed generation

Day 2

DG key issues and multi function interfaces

- DG systems functions
 - DG as an active power source
 - DG attached to PV bus
 - DG attached to PQ bus
- Power quality issues and DG
 - Harmonic pollution
 - Voltage regulation
 - Voltage flicker
- Impact of DG on protection systems
 - Operating conflicts
 - Islanding operation
 - Islanding detection techniques
- Utilizing DG interfaces to enhance power quality levels in distribution systems
 - Reactive power support
 - Voltage regulation
 - Harmonic mitigation
 - Flicker suppression
 - Unbalance mitigation
 - Load isolation from supply side voltage quality problems
- Case studies using software simulation packages

Instructor



Mostafa I. Marei received his Ph.D. degree in electrical engineering from the University of Waterloo, Waterloo, ON, Canada. He is a member of the Institute of Electrical and Electronics Engineers (IEEE) as well as of the Science of Automation Engineering Society.

Currently, Dr. Marei is a Research Associate at the University of Waterloo. His research interests include power electronics, custom power, artificial intelligence, digital control, power quality, and distributed generation.

Dr. Marei has been involved in industrial projects in the areas of electric drives (DC and AC), power electronic converters, power quality and custom power, distributed energy resources and renewable energy.



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