ELECTRICAL DISTRIBUTED GENERATION, RESOURCES and Interconnection Background
Course Introduction:

Distributed Generation. This is one of the hottest subjects in today's fast-paced energy marketplace. Every day the energy sales market becomes more competitive. Whether you are working in a regulated distributed power generation utility, an unregulated energy marketer, or are a large industrial or commercial energy user there are reliability and economic issues that distributed generation can address.

This distributed generation forum is ideal for a wide range of employees from newly hired to seasoned professionals that are looking to gain an understanding of the basics of distributed generation. They will receive an overview of the equipment and the circumstances that are necessary in a successful distributed generation project.

Course Objectives:

Upon the successful completion of this course, each participant will be able to know:

- Understand the basic operation, control and modelling of distributed energy systems
- Describe the basic components of a range of distributed energy sources including wind, PV, hydro, cogeneration, and energy storage systems
- Describe the operation of electrical energy markets and the role distributed and intermittent energy sources play in the marketplace
- Understand and describe the impacts that distributed energy sources are having on the control and operation of electrical networks including voltage control, power factor, power quality
- Describe how demand-side management alters the operation of energy markets.
- Understand and describe the basic characteristics of induction and synchronous generators attached to electrical networks.
- Understand and describe the basic operation of a power electronics inverter and its interface to an electrical network.
- Understand and describe common components found in intelligent networks including telecoms, power electronics, sensing and measurement.
- Describe and understand HVDC systems and their advantages and disadvantages.

Who Should Attend?

This course is directed at electric power engineers, system planners, utility regulators, and DG developers which wish to learn about or enhance their background knowledge in the area of distributed generation interconnection.
Course Outline:

Course Introduction and Overview

DG Technology Review
(This section is a review of the theory, technical status & characteristics of DG devices. Includes ICE Engines, combustion turbines, small steam turbines, fuel cells, photovoltaic sources, wind turbines, thermal-electric generators, micro hydro electric power, energy storage devices)

Power converters
(Power converters play a large role in defining the behavior DG connected to the power system. This section explains the different types of converters used and the key characteristics that define their behavior. Inverters, induction machines, and synchronous machines are covered.)

Power Grid Impacts, Screening and Analysis of DG
(Topics include voltage regulation interactions, voltage flicker issues, fault levels & interactions with feeder over-current devices, neutral grounding design [effective grounding] and transformer configuration selection, temporary overvoltage during ground faults, generator load rejection overvoltage, unintentional islanding impacts, harmonics, ferroresonance, and stability. These concepts are discussed as they apply to DG connected on radial, looped and network distribution systems. Sub transmission level impacts are also discussed. Screening methods for identifying troublesome system impacts are also discussed as well as successful methods for mitigating problems.)

DG Interconnection Standards and Common Practices
Areas discussed include:
- Typical interconnection design layouts for DG systems (sample diagrams)
- IEEE 1547, UL1741 and other standards
- Review of state level interconnection requirements
- Review of federal level requirements (such as FERC Order 2006)
- Discussions of relays, specific relay functions and settings. Suitable for overcurrent protection, abnormal voltage range settings, frequency limits, unbalance protection, reverse power, motoring protection, etc.
- Discussion of anti-islanding protection relays, settings and methods including the various passive and active methods as well as DTT and other forms.

DG Future Integration Issues and Technology Concepts
This section reviews concepts and technology trends that can be useful in helping the system deal with higher penetrations of DG on the system. Topics discussed include:
- Evolution of the grid design and future grid compatibility with DG
• Smart grid role in the future of DG
• Emerging DG control and power conditioning technology trends that will impact integration
• T&D support concepts with DG

Course Methodology:

A variety of methodologies will be used during the course that includes:

• (30%) Based on Case Studies
• (30%) Techniques
• (30%) Role Play
• (10%) Concepts
• Pre-test and Post-test
• Variety of Learning Methods
• Lectures
• Case Studies and Self Questionaires
• Group Work
• Discussion
• Presentation

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course locations. This rate includes participant’s manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.
Course Timings:

Daily Course Timings:

08:00 - 08:20   Morning Coffee / Tea
08:20 - 10:00   First Session
10:00 - 10:20   Coffee / Tea / Snacks
10:20 - 12:20   Second Session
12:20 - 13:30   Lunch Break & Prayer Break
13:30 - 15:00   Last Session