



Training Program:

Modern Electrical Power Systems

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Introduction:

The course starts by reviewing current practice to establish a sound understanding of the underlying principles of power system transmission, distribution, operation and control. Next are considered the developments that are taking place as a result of new forms of generation, load interconnection, fault level limitation and numerous advances in system innovation. The manner in which the new technologies are implemented is related to geographical location, sites requiring additional power, government strategy and technical motivation for change. Not all power systems will advance at the same rate, but all will take advantage of the benefits of technology to a greater or lesser extent, thus improving the overall electrical efficiency.

The course aims to make candidates aware of improvements that technological advances makes possible and to consider implementation these on their system, whether it be a utility, a large end user, or an industrial islanded system. Asset management, DSM, non-linear loads, harmonics and on line diagnostics of plant are also considered, as are ways of improving the utilization and efficiency of system plant.

Target Audience:

This course is designed for those involved with the planning, operation and maintenance of small to large scale power networks, from around 11kV, upwards. Designers, Engineers and Technicians from Distribution Companies, Power Utilities, Engineering Professionals in the Electricity Supply Industry and Petrochemical Companies who have to deal with aspects of generation, transmission and distribution should be interested in learning how to handle increased demand, how to drive the system harder, but safely, and with increased reliability, security and monitoring.

Participants need no specific requirements, other than a good understanding of electricity and some relevant experience in power engineering.

Methodology:

This interactive Training will be highly interactive, with opportunities to advance your opinions and ideas and will include;

- Lectures
- Workshop & Work Presentation
- Case Studies and Practical Exercise
- Videos and General Discussions

Accreditation:

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration

Training Objectives:

At the end of this course, participants will be able to:

- The operation and power flow characteristics of small large networks and how the network can be arranged to deliver more real power over the transmission system to the load centers
- The form and use of a range of FACTS devices to improve system operation

- Fault level limiting devices
- New CT and VT optical transducers and protection relaying system using microprocessor configured relays
- How to deal with non-linear loads and the problem of Harmonics, at the PCC (point of common coupling)
- Protection systems for thermal monitoring of cable networks
- Alternative forms of generation and embedded generation. Carbon emission limiting, etc.
- Diagnostic monitoring of plant and in particular GIS substations
- Advances in power electronics and the application of back to back HV-DC links on stability
- High speed fault limiters and real time stability monitors
- Demand side management

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Daily Agenda:

Introduction to Modern Electrical Power Systems

- Overview of a typical systems covering generation, transmission and distribution
- Determination of flow of real and reactive power
- Determination and control of fault level
- Control of reactive power and voltage
- Control of active power and system frequency

Current Operational Methodology

- Control of fault level
- Reactive power & voltage control
- Active power & frequency control
- The requirement for reactive compensation
- A review of analytical methods & demonstration of software for M E system.
- Increasing problems of heavily loaded systems.

Introduction to System Operation

- Active Power and Frequency Control
- Voltage Control and Reactive Power Requirements

- Generation, including small embedded generators
- Transmission System
- Distribution Systems
- The split system concept

Emerging technologies

- Energy and the Environment - solar power, etc and CO2 and its impact on the world
- 'Green' generation?
- Demand Side Management – remote load control
- Optical Current Transducers for
- High Voltage Applications
- Optical Current Sensors Eliminate
- CT Saturation

Advances in control and monitoring

- Power Electronics Applied to Power Systems
- Flexibility in AC Systems
- Static Var Compensation
- Series Controlled Capacitors

- Changing maintenance schedules, remote surveillance of plant and the introduction of unmanned substations.

Making the system work harder

- HC-DC Links
- Power Dynamics Management
- Advanced protection and Control Techniques
- Is – Limiter
- GIS diagnostics
- Scada and artificial intelligence systems for fault diagnostics

System protection

- Digital and Micro Processor Protection
- Electrical Insulation - Air and SF6
- Condition Monitoring of Plant
- Optical cable temperature monitoring
- Appendix - Characteristics of a Power Network Review