# Training Program:

## Renewable Resources And Distribution Protection System With Communication

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## Who Should Attend?

Personnel working in all areas of electricity section who wish to understand the various aspects of smart metering and smart grid, Managers, network and distribution engineers, Instrumentation engineers, senior technical staff, plant designers, plant managers, Energy Management System, etc.

## CASE STUDY

- Areas of Distribution Automation System Implementation
- Distribution Substation
- Feeder Automation
- Distribution Automation Products
- Advanced Distribution Automation
- Case Study for installation

## Objective:

New solutions to the protection, control, and monitoring of power systems are being put to work all the time, by scientists, engineers, and technicians in utilities and industry around the world. The expansion of the existing interconnected electric power transmission systems offers significant advantages with respect to operational security, integration of renewable energy, as well as energy trading. Communication technology plays an important role in power system operation and management. This

role is expanding because of lower transmission margins, fluctuating market demands, and the need for more efficient power system operation, improved reliability, and faster response to power system events. System wide network based communication technologies, such as SONET and Ethernet, allow contact with virtual protection, control and monitoring in power system. This of course will help remote equipment monitoring, centralized control, distributed peer to peer control, wide area protection, etc. The recent communication, local processing and time synchronized measurements will open many paths to improve power system protection and control

## Course Outline

**MODULE-01: POWER SYSTEM COMMUNICATIONS**

- Introduction
- Communications System
- Pilot protection
- distribution automation in Substation
- Wide area protection and control
- SCADA and EMS
- Security in Communication
- Engineering access and maintenance
- Communications Channels
- Channel capacity, reliability, availability, Propagation delay

- Fiber Optic Communication
- Types and characteristics Optical fiber

**Connectors and transceivers in Fiber-optic**

- Dedicated fiber optic channels
- Commercial fiber-optic transceivers applications
- Remote I/O modules in Fiber optic
- Temperature measurement
- Fiber optic Shared channels and multiplexers
- direct fiber-optic interface to multiplexers
- SONET
- Ethernet transport
- native Ethernet and SONET
- Integrated Communications Optical Network

**MODULE-02: WIRELESS SYSTEMS, MICROWAVE AND ETHERNET COMMUNICATION**

- Narrow VHF/UHF
- Spread-spectrum
- Protection and Modern Communication
- protection schemes with Communication
- Reliability of communication in protection

- Communications standards
- Environmental and performance standards
- Communications and MIRRORED BITS
- Communications (Description, Security, Dependability, etc.)
- Channel performance
- Case Study
- Logic processor and MIRRORED BITS
- Ethernet port speed and fiber-optic interface
- Full-duplex operation and collision-free environment
- IEEE 802.3x
- Flow control
- Priority queuing and VLAN support
- Loss-of-link management
- Remote monitoring, port mirroring, and diagnostics
- LAN-based network protocols
- Protection message
- Protection and Ethernet standards
- Ethernet radio

**MODULE-03: INFORMATION PROCESSING**

- Introduction
- Technology, Operation and Information Technology
- IED Relays
- IED Networks
- Communication and IEDs
- Integrated IED networks
- Process level, Unit level, Station level, Enterprise level
- Serial networks and Ethernet LANs
- LAN configurations Star, multidrop, and ring
- Practical Methods support serial and Ethernet LANs
- Practical Methods for protection, control, and monitoring networks
- IEDs Improve Data Processing
- Power system data
- IEDs processing
- IED communication surpasses and SCADA
- IEDs situational awareness
- IEDs and apparatus data models
- Migration to routable protocols reduces security and increases complexity

- Message payload transparency
- Commercial protocols
- Routing the nonroutable
- Protecting transparent data and routable messages
- Routing performance
- protocols with optimal blend
- LAN Functionality
- Practical scientific measures
- information processors and Network
- Data processing Automation functions and Network functions
- Class Networks
- Modern communications methods and IED network
- ICON networks
- IEC Standard 61850 Network Evaluation Methods
- IEDs Monitoring, Deciding, and Acting
- Separate protection and automation

**MODULE-04: PROTECTION, AUTOMATION, AND MONITORING IN DISTRIBUTION SYSTEM**

- Limitations of Traditional Overcurrent Protection

- Modern Solutions for Distribution System Protection, Automation, and Monitoring
- More sensitive fault detection
- Faster fault clearing
- Faster service restoration
- Higher reliability and lower cost
- Directional elements for phase fault protection
- Directional elements for ground fault protection
- Improving Ground Fault Protection Sensitivity
- Effect of Load Current
- Distributed Generation Considerations
- Distributed generation impacts utility system protection
- High-Speed Distribution System Protection
- Purpose of a substation control enclosure
- Protection, control, and monitoring panel design
- Effects of integrated protection, control, and monitoring systems on enclosure design
- Substation control enclosure environmental system
- Eliminating the centralized control enclosure

**MODULE-05: DISTRIBUTION AUTOMATION**

- Distribution automation objectives
- Automatic throw-over schemes
- Distribution network fast-restoration schemes
- Centralized distribution automation systems
- Examples of distribution protection and automation systems
- Faulted Circuit Indicators
- Benefits of faulted circuit indicators
- Faulted circuit indicator applications
- Combine faulted circuit indicators and relays for fast fault location
- Restricted Ground Fault Protection
- Transformer overload protection
- Communications
- Networking interfaces - 10Mbps Ethernet, RS232, RS485 and RS422 ports
- Ethernet port, 10Mbps
- Multiple protocols - ModBus™ RTU, ModBus™ RTU TCP/IP, DNP 3.0 Level 2

## Accreditation:

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