Tel No:+97126654546 | Fax No:+97126654182 | Email: training@cmc-me.com | www.cmc-me.com

IE288:
Distribution Substation Automation

Training Description:

Distribution Substation Automation (DSA) is a critical enabler of modern, intelligent power distribution networks. With the increasing demand for reliability, efficiency, safety, and integration of renewable and distributed energy resources, utilities are transitioning from conventional substations to automated, data-driven and remotely controlled systems.

This intensive training course provides a **practical and in-depth understanding of distribution substation automation architectures, systems, and technologies**. Participants will gain hands-on knowledge of **Intelligent Electronic Devices (IEDs), SCADA, communication protocols (IEC 61850, DNP3, Modbus), protection and control integration, cybersecurity, condition monitoring and smart grid interoperability**. The training course bridges theory and real-world implementation, focusing on planning, design, operation, maintenance and future expansion of automated distribution substations.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Understand the architecture and components of automated distribution substations
- ✓ Design and evaluate substation automation systems (SAS) for distribution networks
- ✓ Configure and integrate IEDs, RTUs and SCADA systems
- ✓ Apply IEC 61850 concepts for protection, control and communication
- ✓ Implement monitoring, control and fault management strategies
- ✓ Enhance system reliability, safety and operational efficiency
- ✓ Address cybersecurity risks in substation automation environments
- ✓ Support smart grid initiatives and future digital substations

Training Designed for:

This training course is intended for Distribution Utility Engineers and Technicians, Substation Design, Protection and Control Engineers, SCADA and Automation Engineers, Electrical Maintenance and Operations Personnel, Power System Planners and Asset Management Engineers, Smart Grid and Digital Transformation Teams, Consultants and EPC Professionals involved in substations and Technical Managers and Supervisors in power utilities.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ FUNDAMENTALS OF DISTRIBUTION SUBSTATION AUTOMATION
- ❖ Overview of Distribution Substations

- Role of distribution substations in power systems
- Conventional vs automated distribution substations
- Typical voltage levels and configurations
- Primary equipment overview (transformers, breakers, switchgear)

❖ Introduction to Substation Automation Systems (SAS)
- Objectives and benefits of automation
- Functional layers: process, bay and station level
- Substation automation architecture
- Integration with distribution management systems (DMS)

❖ Key Components of Automation
- Intelligent Electronic Devices (IEDs)
- Remote Terminal Units (RTUs)
- Protection and control panels
- Human Machine Interface (HMI)

❖ Operational Benefits
- Improved reliability and reduced outage duration
- Faster fault detection and isolation
- Remote monitoring and control
- Reduced operational and maintenance costs

DAY TWO:

❖ COMMUNICATION SYSTEMS AND PROTOCOLS

❖ Substation Communication Infrastructure
- Copper vs fiber-optic communication
- Ethernet networks in substations
- Network topology and redundancy concepts

❖ Communication Protocols
- IEC 61850 fundamentals and evolution
- Logical nodes, data models and services
- GOOSE messaging and Sampled Values
- MMS communication

❖ Legacy and Supporting Protocols
- DNP3, Modbus, and IEC 60870-5-101/104
- Protocol interoperability and gateways
- Migration from legacy systems to IEC 61850

❖ Time Synchronization and Data Accuracy
- Importance of time stamping
- GPS, IRIG-B and IEEE 1588 PTP
- Event and disturbance recording

DAY THREE:

❖ PROTECTION, CONTROL, AND MONITORING INTEGRATION

❖ Protection Schemes in Distribution Substations
- Overcurrent and earth fault protection
- Feeder, transformer and busbar protection
- Adaptive protection concepts
- Coordination with upstream and downstream networks

- Automation Functions
  - Automatic feeder reconfiguration
  - Fault detection, isolation and restoration (FDIR)
  - Load shedding and voltage control
  - Interlocking and control logic
- Condition Monitoring and Asset Health
  - Transformer monitoring (temperature, gas, partial discharge)
  - Circuit breaker monitoring
  - Predictive and condition-based maintenance
  - Integration with asset management systems
- Event Management and Diagnostics
  - Sequence of events (SOE) analysis
  - Disturbance recording and fault analysis
  - Alarms and reporting strategies

DAY FOUR:

- SCADA, CYBERSECURITY AND SYSTEM RELIABILITY
- SCADA Integration
  - SCADA architecture for distribution substations
  - Data acquisition and control strategies
  - HMI design principles
  - Alarm management and operator workflows
- Cybersecurity in Substation Automation
  - Cyber threats to power utilities
  - Common vulnerabilities in SAS and SCADA
  - Security standards (IEC 62351, NERC CIP overview)
  - Network segmentation and access control
- System Reliability and Redundancy
  - Redundant communication paths
  - High availability system design
  - Fail-safe and fallback modes
  - Testing and commissioning strategies
- Maintenance and Lifecycle Management
  - Testing of IEDs and automation systems
  - Firmware and configuration management
  - Documentation and change management

DAY FIVE:

- SMART GRID INTEGRATION AND FUTURE TRENDS
- Distribution Automation and Smart Grids
  - Role of substations in smart distribution networks
  - Integration with AMI, DERs, and microgrids
  - Volt/VAR optimization and power quality monitoring
- Digital and IEC 61850 Process Bus Substations
  - Digital substations concepts
  - Merging units and non-conventional instrument transformers
  - Benefits and implementation challenges

- ❖ Practical Case Studies
  - Real-world distribution substation automation projects
  - Lessons learned from successful implementations
  - Common design and operational challenges
- ❖ Future Trends and Roadmap
  - AI and analytics in substation automation
  - Cloud and edge computing applications
  - Standards evolution and interoperability
  - Developing a utility automation roadmap
- ❖ Course Conclusion
- ❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

USD$ TBA - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:
Aisha Relativo - Training & Career Development Manager
aisha@cmc-me.com / training@cmc-me.com
Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615