A Training Course on HVDC Power Transmission System: Best Practices For Engineers

30 August – 3 September 2027
Addis Ababa

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Ref: 36248_224959 **Date:** 30 August – 3 September 2027 **Location:** Addis Ababa **Fees:** 6000 Euro

Course Overview:

A Training Course on HVDC Power Transmission System is meticulously designed to equip participants with in-depth knowledge and hands-on skills in HVDC technology. This course delves into historical developments in HVDC, comparing HVAC vs. HVDC links in terms of economic and technical performance, reliability, and limitations. Participants will explore the properties of thyristor converter circuits, the choice of the best circuit for HVDC converters, and transformer connections in HVDC systems. Through a combination of theoretical analysis and practical exercises, the course covers bridge converters, HVDC inverter operation, power reversal, and control features. Misoperation protection, converter disturbance, circuit breakers, and overvoltage protection are thoroughly addressed. Furthermore, the course discusses harmonics in HVDC systems, harmonic filters, converter charts, AC-DC system interaction, harmonic instabilities, DC power modulation, and the design of thyristor converters, including converter transformers, smoothing reactions, overhead lines, cable transmission, and earth electrodes. The course also includes the design of back-to-back thyristor converter systems. By the end of this training, participants will master best practices for HVDC systems, enhancing their ability to optimize performance, reliability, and safety.

Target Audience:

- Electrical Engineers
- Power System Engineers
- Maintenance Engineers
- HVDC System Designers
- Technical Managers
- Reliability Engineers
- Energy Consultants

Targeted Organizational Departments:

- Electrical Engineering Departments
- Power Generation and Distribution Units
- Maintenance and Reliability Teams
- Technical Management Divisions
- Research and Development Departments

Targeted Industries:

- Power Generation and Transmission
- Renewable Energy
- Electrical Utilities
- Engineering Consulting Firms
- Manufacturing Industries
- Infrastructure Development

Course Offerings:

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

- Understand the historical developments in HVDC power transmission
- Compare HVAC and HVDC links from economic and technical perspectives
- Analyse thyristor converter circuits and HVDC converters
- Implement effective transformer connections in HVDC systems
- Control and operate HVDC inverters and manage power reversal
- Protect HVDC systems from misoperation, disturbance, and overvoltage
- Address harmonics and apply harmonic filters in HVDC systems
- Interact with AC-DC systems and manage harmonic instabilities
- Design and implement thyristor converters and associated components

Training Methodology:

The training methodology for Training Course combines interactive lectures, case studies, group work, and practical exercises. Participants will engage in hands-on activities to apply theoretical knowledge to real-world scenarios. The course includes feedback sessions to ensure comprehension and address individual concerns. Emphasis is placed on interactive learning methods, enabling participants to discuss challenges and solutions in HVDC systems, analyse case studies on thyristor converters, and participate in group discussions on HVDC inverter operation and control features. This approach ensures a comprehensive understanding of HVDC Power Transmission System, best practices for engineers, and practical application in their respective fields.

Course Toolbox:

- Comprehensive course manual
- Reading materials on HVDC historical developments
- Checklists for HVDC system reliability
- Templates for HVDC control and protection schemes
- Online resources for thyristor converter circuits and HVDC converters
- Case studies on HVAC vs. HVDC economic comparison

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Course Agenda:

Day 1: Introduction to HVDC Systems

- **Topic 1**: Historical Developments in HVDC Power Transmission System: Overview of key milestones in HVDC technology.
- **Topic 2**: HVAC vs. HVDC Links - Economic and Technical Comparison: Comparing economic and technical aspects.
- **Topic 3**: Properties of Thyristor Converter Circuits: Understanding thyristor converter circuits.
- **Topic 4**: Choice of Best Circuit for HVDC Converters: Criteria for selecting HVDC converter circuits.
- **Topic 5**: Transformer Connections in HVDC Systems: Examining transformer connections.
- **Reflection & Review**: Reviewing key points and learnings of the day.

Day 2: Bridge Converters and Control Mechanisms

- **Topic 1**: Analysis of Bridge Converters: Detailed analysis of bridge converters.
- **Topic 2**: HVDC Inverter Operation: Principles of inverter operation.
- **Topic 3**: Power Reversal in HVDC Systems: Methods and implications.
- **Topic 4**: Control Features and Mechanisms: Desired features and control methods.
- **Topic 5**: Actual Control Characteristics in HVDC Systems: Impact on performance and reliability.
- **Reflection & Review**: Reviewing key points and learnings of the day.

Day 3: Misoperation Protection and Disturbance Management

- **Topic 1**: Misoperation of HVDC Converters: Causes and effects.
- **Topic 2**: Protection Against Converter Disturbance: Protective measures.
- **Topic 3**: HVDC Circuit Breakers: Role and functioning.
- **Topic 4**: Overvoltage Protection in HVDC Systems: Methods of protection.
- **Topic 5**: DC Reactors and Voltage Oscillations: Role and impact.
- **Reflection & Review**: Reviewing key points and learnings of the day.

Day 4: Harmonics, Filters, and System Interaction

- **Topic 1**: Harmonics in HVDC Systems: Understanding harmonics.
- **Topic 2**: Harmonic Filters for HVDC Systems: Types and applications.
- **Topic 3**: AC-DC System Interaction: Managing interactions.
- **Topic 4**: Harmonic Instabilities in HVDC Systems: Causes and solutions.
- **Topic 5**: DC Power Modulation and HVDC Voltage Interaction: Techniques and impact.
- **Reflection & Review**: Reviewing key points and learnings of the day.

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Day 5: Design and Implementation of HVDC Systems

- **Topic 1**: Thyristor Converters Design Considerations: Key design aspects.
- **Topic 2**: Converter Transformers in HVDC Systems: Design and operation.
- **Topic 3**: Smoothing Reactions and Overhead Lines: Design and impact.
- **Topic 4**: Cable Transmission and Earth Electrodes: Techniques and considerations.
- **Topic 5**: Back to Back Thyristor Converter Systems: Design principles.
- **Reflection & Review**: Reviewing key points and learnings of the day.

How This Course is Different from Other HVDC Power Transmission System Courses:

The Course stands out by offering a hands-on approach to understanding and implementing HVDC technology. Unlike other courses, this training provides a deep dive into historical developments, economic comparisons, and technical performance of HVDC systems. The course emphasizes practical skills in thyristor converter circuits, HVDC inverters, and transformer connections, ensuring participants can apply best practices in real-world scenarios. Additionally, the course addresses critical aspects of HVDC systems such as misoperation protection, harmonics management, and system interaction, providing a holistic view of HVDC power transmission. With a focus on interactive learning, case studies, and practical exercises, this course ensures participants gain both theoretical knowledge and practical expertise, setting it apart from other HVDC training programs.