



A Training Course on High Voltage Direct Current Transmission (HVDC)

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Course Overview:

This complete course is designed to provide in-depth knowledge and hands-on experience in HVDC High Voltage Direct Current technology. As the demand for efficient long-distance power transmission increases, HVDC systems have become critical in connecting renewable energy sources and stabilizing grids worldwide. The course covers everything from HVDC transmission fundamentals to advanced HVDC converter station design and HVDC system protection and control. Participants will explore key components such as thyristor valves, converter transformers, harmonic filters, and DC transmission circuits, and how they contribute to the efficiency and reliability of HVDC systems. Additionally, the course delves into topics such as AC vs. DC harmonic filters, earth electrode design, and the advantages of HVDC transmission for offshore wind farms. Through expert-led sessions, case studies, and digital models, participants will be equipped to manage HVDC projects, implement design specifications, and ensure reliable HVDC power transmission efficiency.

Target Audience:

- Electrical Engineers
- Power Transmission Technicians
- Renewable Energy Project Managers
- HVDC System Designers
- Grid Integration Specialists

Targeted Organizational Departments:

- Engineering and Design Teams
- Project Management Offices
- Operations and Maintenance Divisions
- Grid Infrastructure and Planning Departments
- Renewable Energy Integration Teams

Targeted Industries:

- Electrical Power Generation
- Renewable Energy Offshore Wind, Solar
- Energy Transmission Companies
- Industrial Manufacturing
- Government Energy Regulatory Agencies

Course Offerings:

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

- Design and manage HVDC transmission line components.
- Understand HVDC system protection and control strategies.
- Optimize the use of smoothing reactors and harmonic filters in HVDC systems.
- Implement HVDC converter theory in practical projects.
- Analyze the efficiency of HVDC vs AC transmission systems.
- Utilize digital models for HVDC system studies.

Training Methodology:

This course will incorporate a combination of theoretical and practical learning methods. Participants will take part in interactive sessions where they will work on real-world HVDC project implementations. Case studies will examine successful HVDC grid integration for renewable energy sources. Group work will be used to discuss complex HVDC design specifications, and feedback sessions will provide insight into the application of HVDC transmission system planning.

Course Toolbox:

- workbooks on HVDC transmission
- Case studies on HVDC grid integration
- Checklists for HVDC converter station design and maintenance
- Templates for HVDC project management

Course Agenda:

Day 1: Introduction to HVDC and Transmission Schemes

- **Topic 1:** Why High Voltage Direct Current?
- **Topic 2:** Main Types of HVDC Schemes
- **Topic 3:** Converter Theory
- **Topic 4:** Principle Arrangement of an HVDC Transmission Project
- **Topic 5:** Overview of HVDC System Benefits
- **Topic 6:** Comparison of HVDC and AC Transmission Systems
- **Reflection & Review:** Reflect on the key differences between HVDC and AC systems and the importance of HVDC in modern power grids.



Day 2: Components of HVDC Systems

- **Topic 1:** Thyristor Valves in HVDC Systems
- **Topic 2:** Converter Transformer Design and Function
- **Topic 3:** Smoothing Reactor: Purpose and Implementation
- **Topic 4:** Harmonic Filters: AC Harmonic Filters
- **Topic 5:** Harmonic Filters: DC Harmonic Filters
- **Topic 6:** Harmonic Filters: Active Harmonic Filters
- **Reflection & Review:** Discuss the role of these components in improving HVDC transmission efficiency and reducing system faults.

Day 3: HVDC Transmission Circuits and Protection Systems

- **Topic 1:** DC Transmission Circuit Overview
- **Topic 2:** DC Transmission Line Design and Technology
- **Topic 3:** DC Cables in HVDC Systems
- **Topic 4:** High-Speed DC Switches
- **Topic 5:** Earth Electrode: Purpose and Design in HVDC
- **Topic 6:** Surge Arresters in HVDC Systems
- **Reflection & Review:** Review how these components ensure safe and reliable HVDC transmission.

Day 4: Control, Protection, and Digital Modeling

- **Topic 1:** Control and Protection in HVDC Systems
- **Topic 2:** Digital Modeling for HVDC System Studies
- **Topic 3:** Design Specifications for HVDC Projects
- **Topic 4:** Fault Management and Recovery in HVDC Systems
- **Topic 5:** HVDC Grid Integration and Control Systems
- **Topic 6:** Advanced HVDC Protection Strategies
- **Reflection & Review:** Reflect on the use of digital models and control systems to enhance HVDC operations.

Day 5: HVDC Project Management and Practical Applications

- **Topic 1:** HVDC Project Management Best Practices
- **Topic 2:** Implementing HVDC Transmission Projects
- **Topic 3:** System Maintenance and Reliability in HVDC
- **Topic 4:** Benefits of HVDC for Offshore Wind Farms
- **Topic 5:** HVDC Transmission Efficiency: Practical Insights
- **Topic 6:** HVDC System Planning for Long-Distance Transmission
- **Reflection & Review:** Review of project management techniques and how they contribute to the successful implementation of HVDC systems.



How This Course is Different from Other Training Courses:

High Voltage Direct Current HVDC Transmission Training Course offers a complete approach to HVDC transmission. This course focuses on both the theoretical and practical aspects of HVDC system design, installation, and maintenance. It covers in-depth sessions on HVDC system protection and control, converter theory, and advanced HVDC control systems, preparing participants to address modern HVDC grid integration challenges. Additionally, the course includes advanced digital models and case studies to help participants apply their knowledge to real-world HVDC projects. The unique combination of theoretical knowledge and hands-on training sets this course apart in the field.



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