CONCEPT

HVDC Transmission and FACTS Devices: Converter Technology, STATCOM, SVC and Series Compensation

31 October – 4 November 2027
Dammam - Eastern Province five-star



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Introduction:

HVDC Transmission and FACTS Devices is a 1-week course for transmission planning, protection, operations and project engineers, ending with a Technology Selection Memorandum and Study Scope for a case bulk transmission link. It helps organisations facing congested corridors, long cable routes and weak grids choose between new AC lines, HVDC links, STATCOM, SVC and series compensation on evidence rather than habit. Nominees already run network studies, protection settings, control-room operation or project specifications, and learning is by case study on converter and corridor data. This HVDC and FACTS course is delivered by CoreConcept Training Center.

Course Objectives:

- Justify when an HVDC link, a new AC line or a FACTS upgrade suits a transmission need, using route length, cable share, grid synchronism and transfer limits
- Compare LCC and VSC converter technology, station equipment and monopole, bipole and back-to-back configurations for a proposed link
- Specify SVC, STATCOM and series compensation duties for voltage control and transfer capacity on a stressed corridor
- Review HVDC control modes and protection sequences for DC faults, converter blocking and commutation failure
- Define the interaction studies, spares and maintenance arrangements a converter or FACTS installation needs over its service life
- Prepare a technology selection memorandum and study scope with an AC versus DC cost comparison for a bulk transmission link

Target Audience:

- Transmission planning engineers responsible for corridor reinforcement options and network studies
- Protection engineers responsible for relay settings and fault clearing near converter and compensation equipment
- System operations engineers responsible for voltage control, power flow scheduling and converter dispatch
- Project engineers responsible for specifying, procuring and commissioning converter stations and FACTS installations
- Asset and maintenance engineers responsible for the availability of power electronic transmission equipment

Course Outline:

Day 1: HVDC and FACTS Drivers, Transmission Options and Network Needs

- Bulk Power Transfer Drivers Behind HVDC and FACTS Investment
- AC Line Limits From Reactance, Charging Current and Angle
- HVDC Break-Even Distance for Overhead and Cable Routes
- Asynchronous Grid Coupling Through Back-to-Back Converter Stations
- Network Needs Screening for Congested and Weak Corridors

Day 2: Converter Technology, Station Equipment and HVDC Configurations

- LCC Thyristor Valves, Commutation and Reactive Power Demand
- VSC and Modular Multilevel Converter IGBT Submodule Operation
- Converter Transformers, Smoothing Reactors and AC and DC Filters
- Monopole, Bipole and Metallic Return Configuration Trade-Offs
- HVDC Cable Types, Interconnectors and Multi-Terminal DC Grids

Day 3: FACTS Devices, Reactive Power Compensation and HVDC Control

- SVC Thyristor-Controlled Reactor and Switched Capacitor Sizing
- STATCOM Converter Rating and Low-Voltage Current Capability
- TCSC and Fixed Series Capacitors for Transfer Capacity
- UPFC and SSSC Power Flow Control Principles Overview
- HVDC Converter Control Modes, Power Orders and Reversal

Day 4: HVDC Protection, Grid Interaction Risks and Converter Maintenance

- DC Line Fault Clearing, Converter Blocking and DC Breakers
- Commutation Failure Risk and Short Circuit Ratio Checks
- Subsynchronous Resonance Screening for Series-Compensated Corridors
- Harmonic and Control Interaction Studies for Converter Plants
- Valve Hall Maintenance, Spares Strategy and Energy Availability Indicators

Day 5: Case Study: Technology Selection and Study Scope for a Bulk Link

- Case Link Brief With Corridor, Load Centres and Renewable Zones
- AC Versus DC Cost Comparison Including Losses and Converters
- LCC, VSC or FACTS Upgrade Option Scoring Matrix
- Planning Study Scope Covering Load Flow, Fault and Dynamics
- Technology Selection Memorandum and Study Scope Peer Review

Skills You Will Gain:

- HVDC Technology Screening
- Converter Configuration Selection
- Reactive Compensation Sizing
- Series Compensation Assessment
- Converter Protection Review
- Grid Interaction Risk Screening
- Transmission Cost Comparison
- Study Scope Definition

Why Attend This Course:

- Deliver a Technology Selection Memorandum and Study Scope for a case bulk link, ready for the planning manager and investment committee
- Decide whether a corridor needs an HVDC link, a STATCOM, an SVC or series compensation before consultants are appointed
- Avoid commissioning delays caused by commutation failure, resonance and harmonic interaction left out of early study scopes
- Brief protection, operations and project colleagues on converter behaviour and FACTS limits in shared technical terms

Conclusion:

Back at work, the planning manager can use the Technology Selection Memorandum and Study Scope to decide which transmission option moves to detailed studies and tendering, while protection, operations and project teams use its study list to agree responsibilities early. The memorandum gives procurement a basis for specifying converter or compensation equipment and gives operations a first view of control and maintenance needs. After its first use, the organisation should check whether cost assumptions, short circuit ratio figures and interaction risks matched the detailed study results, and refine the screening method.