# High-Voltage Transmission Planning Course: HVDC, FACTS and Corridor Capacity

5 – 9 September 2027
Kuala Lumpur

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## Programme Summary

High-voltage transmission planning, covering HVDC, FACTS and corridor capacity, is the subject of this one-week training course for transmission planning, investment and engineering leaders, ending in a capacity options appraisal for one corridor. Corridors reach their limits before new lines can be built, and choices between new circuits, HVDC links, controllable devices and better line ratings are often made on thin comparison. The programme moves from corridor limits to line rating, FACTS devices, HVDC links and ranked options, using prepared corridor data. Mars Training Centre UK delivers this programme on high-voltage transmission planning to mixed-organisation cohorts.

## The Business Case

Transmission owners and large generation or industrial users face congestion on corridors that are costly and slow to extend. Leaders who understand what limits a corridor, and what each capacity option can and cannot change, avoid committing to a solution that leaves the binding limit in place and can show boards why one option was preferred.

- Congestion Cost: Falls when the option chosen relieves the limit that actually binds the corridor.
- Capital Efficiency: Improves when lower-cost measures are tested before new circuits are committed.
- Decision Lead Time: Shortens when options are compared on one sheet with stated assumptions.

## Principles and Evidence Base

- Dynamic Line Rating: A method, described in CIGRE material, that uses weather and loading data to set overhead line ratings, applied in Session 2.
- Flexible AC Transmission Systems: Controllable devices that adjust voltage and power flow, applied in Session 3 to screen placement.
- HVDC Transmission: Direct-current links for bulk power transfer, applied in Session 4 to compare with alternating-current circuits.

## Intended Participants

- Transmission planning managers who define capacity needs and shortlist options.
- Investment leaders who approve grid expansion budgets.
- Engineering managers who review technical studies and technology proposals.
- Commercial and interconnection managers who negotiate capacity with generators and large users.

Typical settings include national grids, interconnectors, renewable generation hubs and large industrial supply corridors.

## Learning Outcomes

1. Participants will be able to diagnose which thermal, voltage or stability limit binds a corridor.
2. Participants will be able to evaluate the capacity uplift available from dynamic line rating.
3. Participants will be able to evaluate FACTS devices for a corridor by purpose and placement.
4. Participants will be able to compare HVDC links with alternating-current circuits on capacity, losses and controllability.
5. Participants will be able to prioritise capacity options and justify the ranking to an investment board.

## Programme Structure

## Day 1: High-Voltage Transmission Planning Foundations

What limits the power that a corridor can carry?

- Corridor Limit Register
- Thermal, Voltage and Stability Limit Split
- Planning Need Statement
- Loss and Congestion Cost Sheet
- Option Longlist

## Day 2: Line Rating and Dynamic Line Rating

How much more can the existing lines carry?

- Static Rating Review
- Dynamic Line Rating Concept Sheet
- Weather Data Requirement List
- Sensor and Monitoring Options
- Rating Uplift Estimate

## Day 3: FACTS Devices

Which controllable devices help a corridor, and where do they belong?

- Series Compensation Case
- Shunt Compensation Case
- Static Var Compensator Review
- Power Flow Control Device Review
- Placement Screening Sheet

## Day 4: HVDC Links

When does a direct-current link outperform an alternating-current circuit?

- HVDC Link Concept Sheet
- Overhead and Cable Route Comparison
- Converter Station Footprint Review
- Link Controllability Table
- Loss Comparison Table

## Day 5: Capacity Options Appraisal for One Corridor

Do the findings join into a ranked set of capacity options?

- Applying the Session 1 Corridor Limit Register
- Testing the Session 2 Rating Uplift Estimate
- Comparing the Session 3 and Session 4 Option Sheets
- Preparing the Option Ranking Matrix
- Completing the Capacity Options Appraisal

## Methodology

The programme is a structured exercise built on prepared data for two corridors, one carrying renewable generation and one supplying an industrial region. Participants diagnose limits, test each capacity measure and defend an option ranking to peers acting as an investment board.

- Suggested activity: Splitting a corridor limit into thermal, voltage and stability parts.
- Suggested activity: Estimating the rating uplift from weather data on one line.
- Suggested activity: Comparing an HVDC link and a new alternating-current circuit on one sheet.

## Capstone Output

Each participant completes a capacity options appraisal for one corridor. It holds a limit register, a rating uplift estimate, device and link option sheets, a ranking matrix and a short recommendation. At work it goes to the investment board and sets the comparison routine for later corridors.

## Frequently Asked Questions

### Is high-voltage transmission planning training suitable for managers who are not power engineers?

Yes. High-voltage transmission planning is taught through prepared corridor data and templates. You need responsibility for planning, engineering or investment in a grid, but no earlier design experience.

### Which methods does high-voltage transmission planning rest on in this training?

High-voltage transmission planning rests on corridor limit analysis, dynamic line rating, flexible AC transmission systems and HVDC transmission, compared on one option sheet.

## How is the appraisal from high-voltage transmission planning training used at work?

You put the capacity options appraisal to your investment board, use its ranking to justify the chosen measure, and keep its sheets as the routine for later corridors.

## How does high-voltage transmission planning differ from a programme on electricity distribution planning?

High-voltage transmission planning concentrates on bulk corridors and capacity options such as HVDC, while a programme on electricity distribution planning concentrates on local network capacity and customer connections.