Technical Standardisation of HVDC Systems

National HVDC Centre Operators Forum 2024

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Road Map

- Who is Presenting
- SSEN Transmission HVDC
- Challenges for delivery
- Concepts for solutions
- Current state

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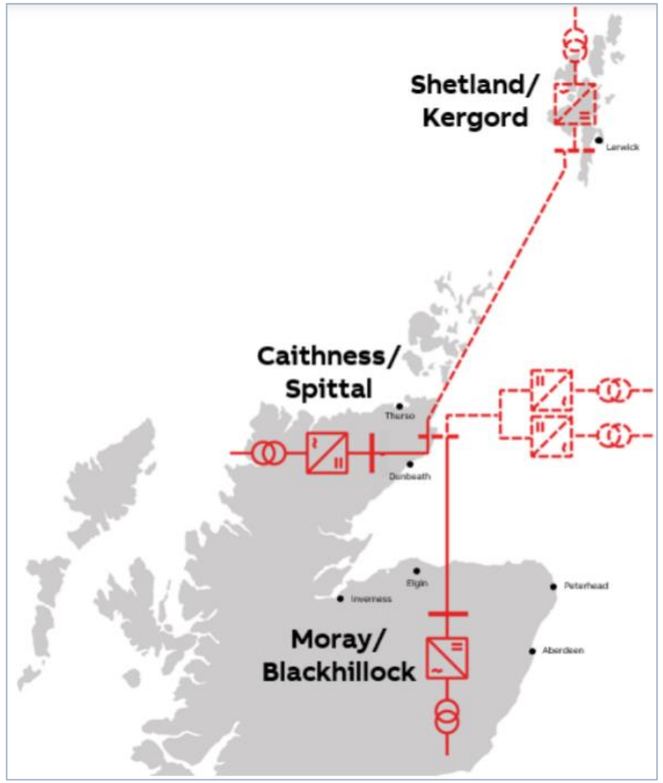
HVDC History and Outlook

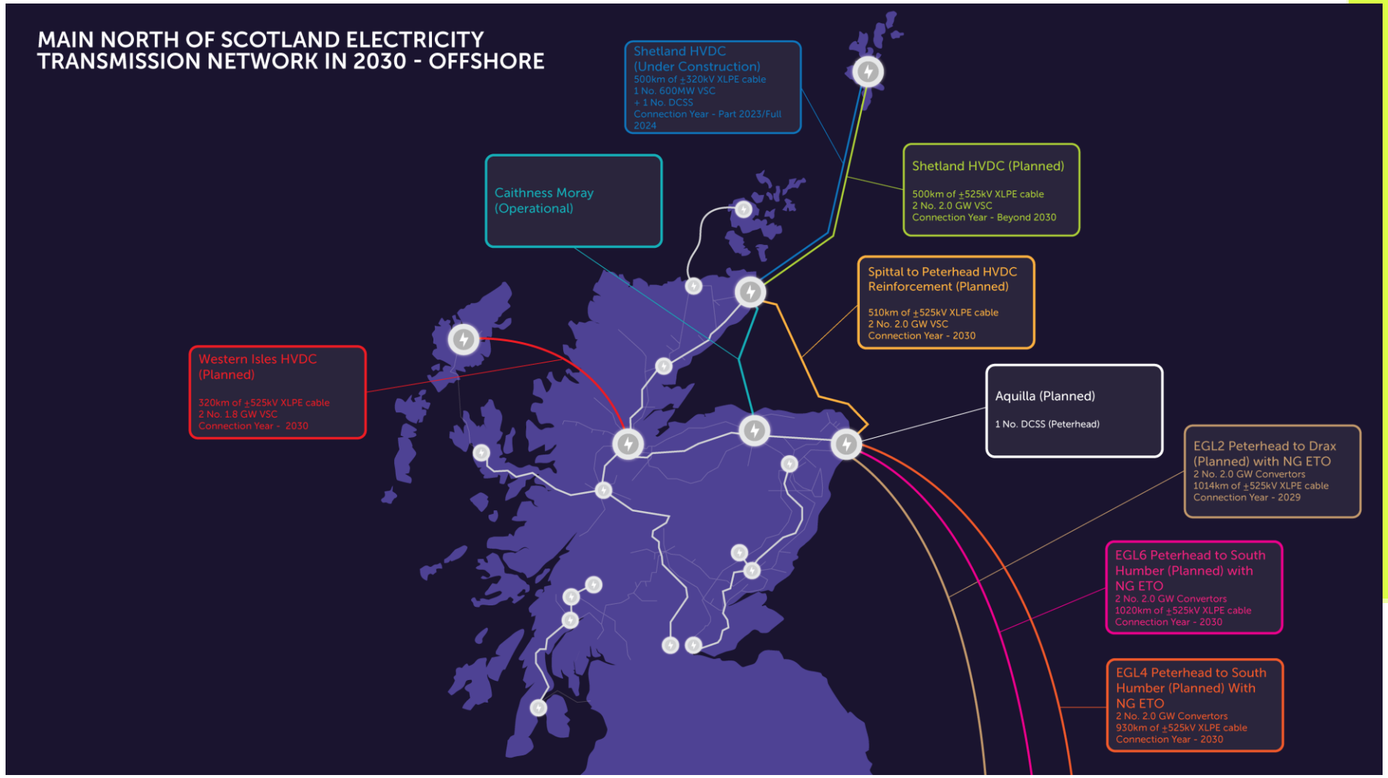
2018: ±320kV 1200MW VSC HVDC System (CM)

- 2024: Expansion to 3-terminal (CMS)



2021: 1 project announced (EGL2)

- 2022: 3+ additional projects announced for 2030 delivery (Pathway to 2030)



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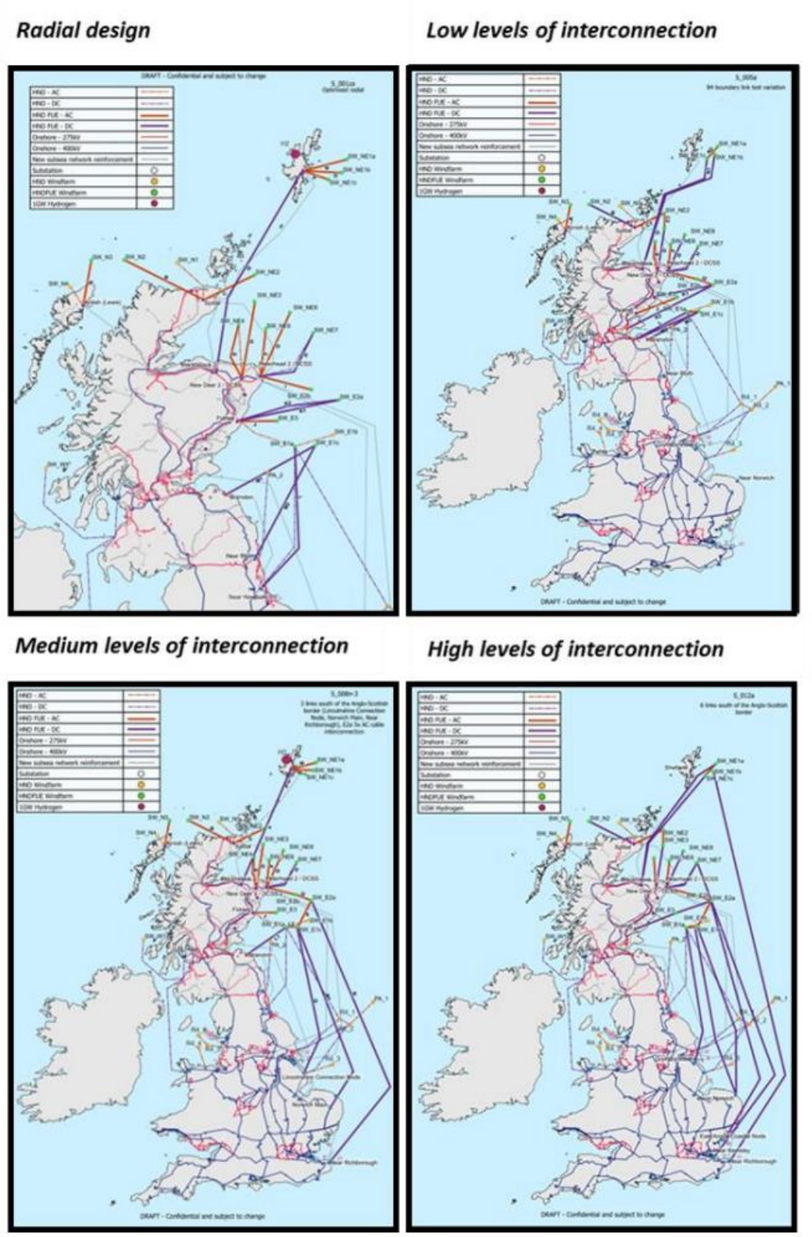
HVDC Outlook

2024: HND follow-up announced

- Additional 3+ (?) HVDC Systems
- Offshore hubs
- Onshore hubs



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Building HVDC for 2030 and beyond

Key Challenges and Concept Solutions

- Challenges
  - Global supply chain limitation
  - Development, planning, and consenting
  - Power System Stability
  - Knowledge and Training

- Concept for Solution?
  - Standardisation

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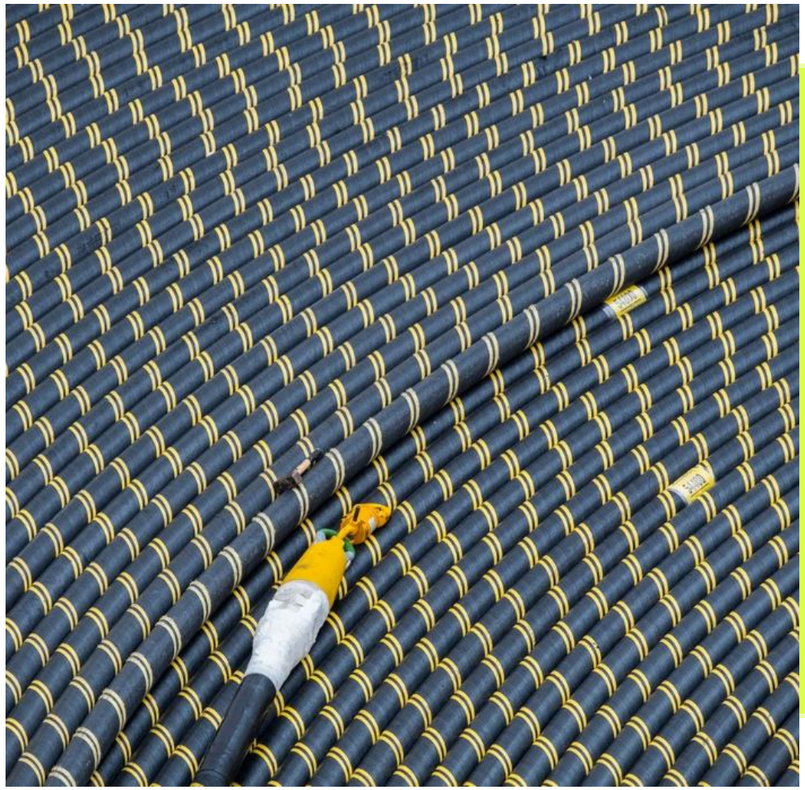
Standardising HVDC

Principles of application

- Challenge to bespoke design mindset
  - Do we need perfection?
- Over-engineer by design
  - Design to an “envelope”
- Shared risk with supply chain
  - Target collaborative contracts and behaviours

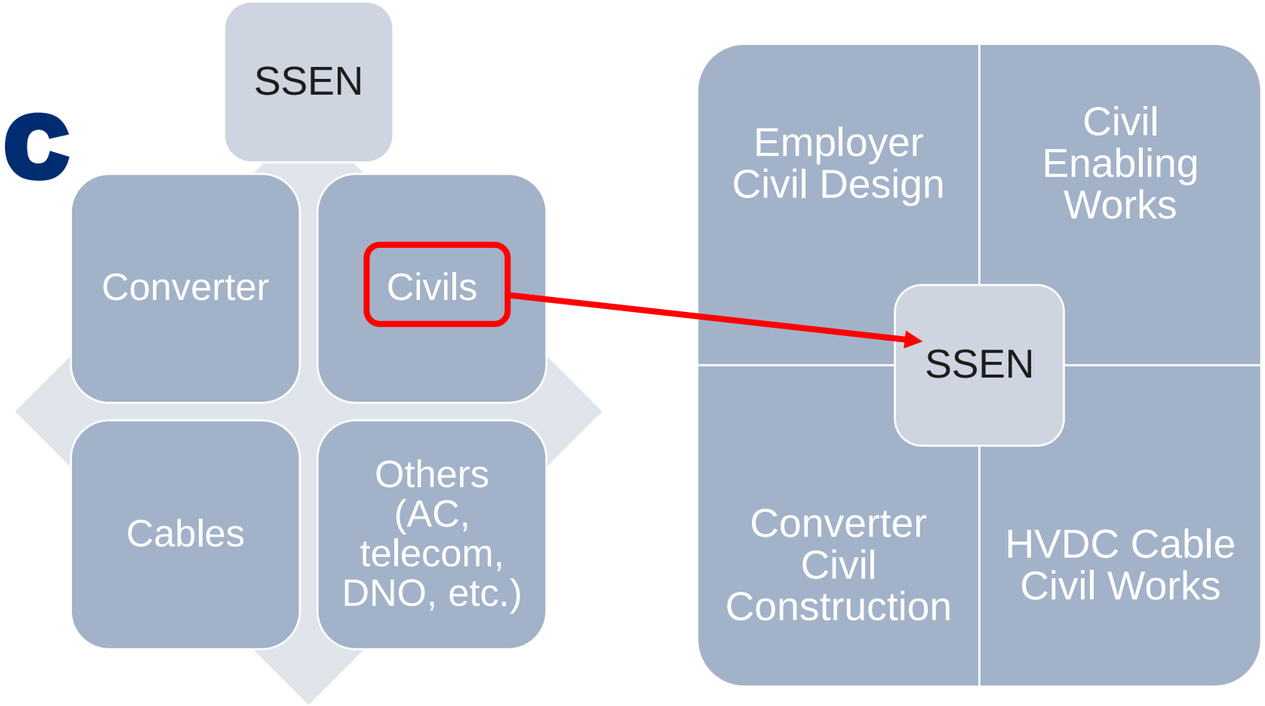


Standardising HVDC

SSEN Transmission Current State

- Delivery model
  - Disaggregated contracts
  - Employer owned civil design

- Technical Selection & envelope
  - VSC 2GW, 525kV
  - Worst-case cable lengths and parameters
  - DC Voltage (*Nominal* and *Highest*)
  - Sending MW



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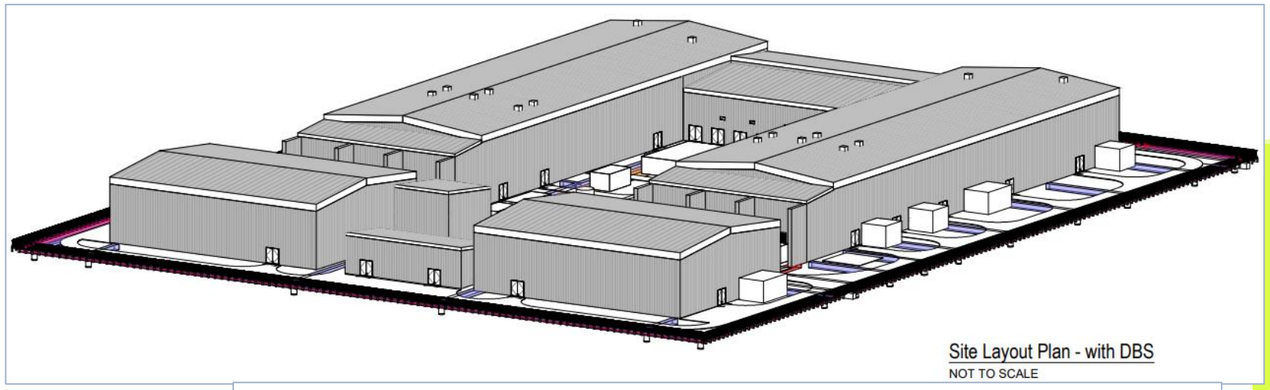
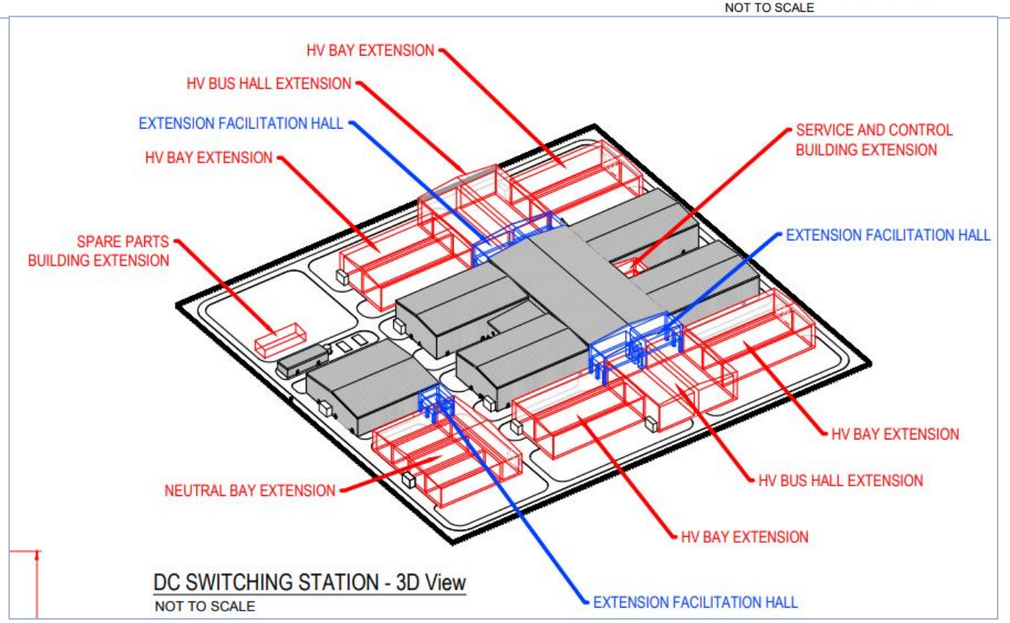
Standardising HVDC

SSEN Transmission Current State

- Layout / arrangement Challenges
  - Suppliers attempted standard product
  - DMR / no DMR
- Transformer Consideration
  - Voltage range
  - Cable lengths
- Valve considerations
  - Multiterminal extension
  - Grid-forming





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SSEN Transmission Current State

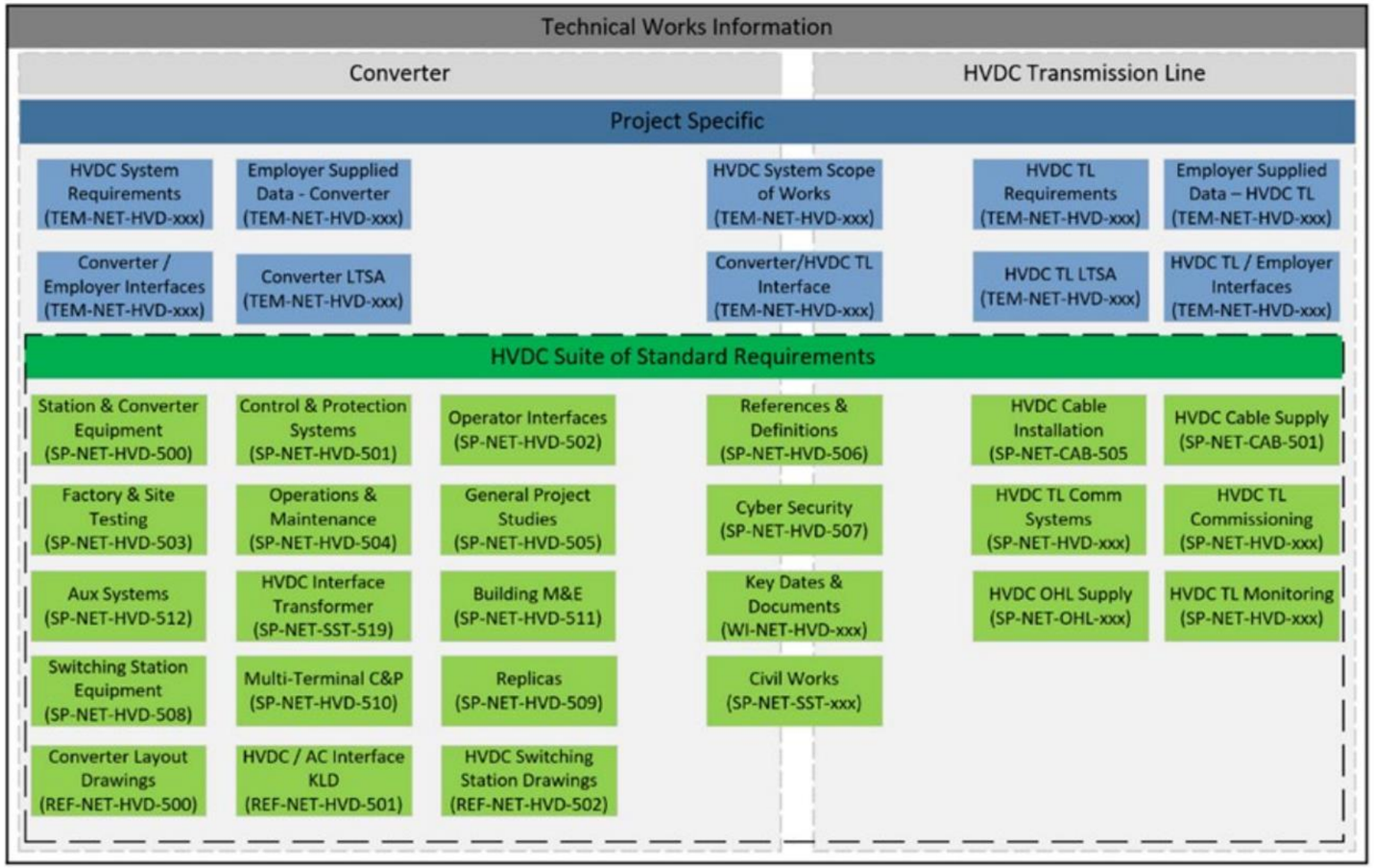

Figure 3.2 - Future State – HVDC Technical Project Works Information & Project Data Structure

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Standardising HVDC

SSEN Transmission Current State

- Multiterminal readiness?
  - Space for Dynamic Braking Systems
  - Consideration for DCCB
  - Min / Max TOV
  - Proposed control architecture
  - Industry Participation
    - Aquila, InterOPERA, CIGRE, etc.

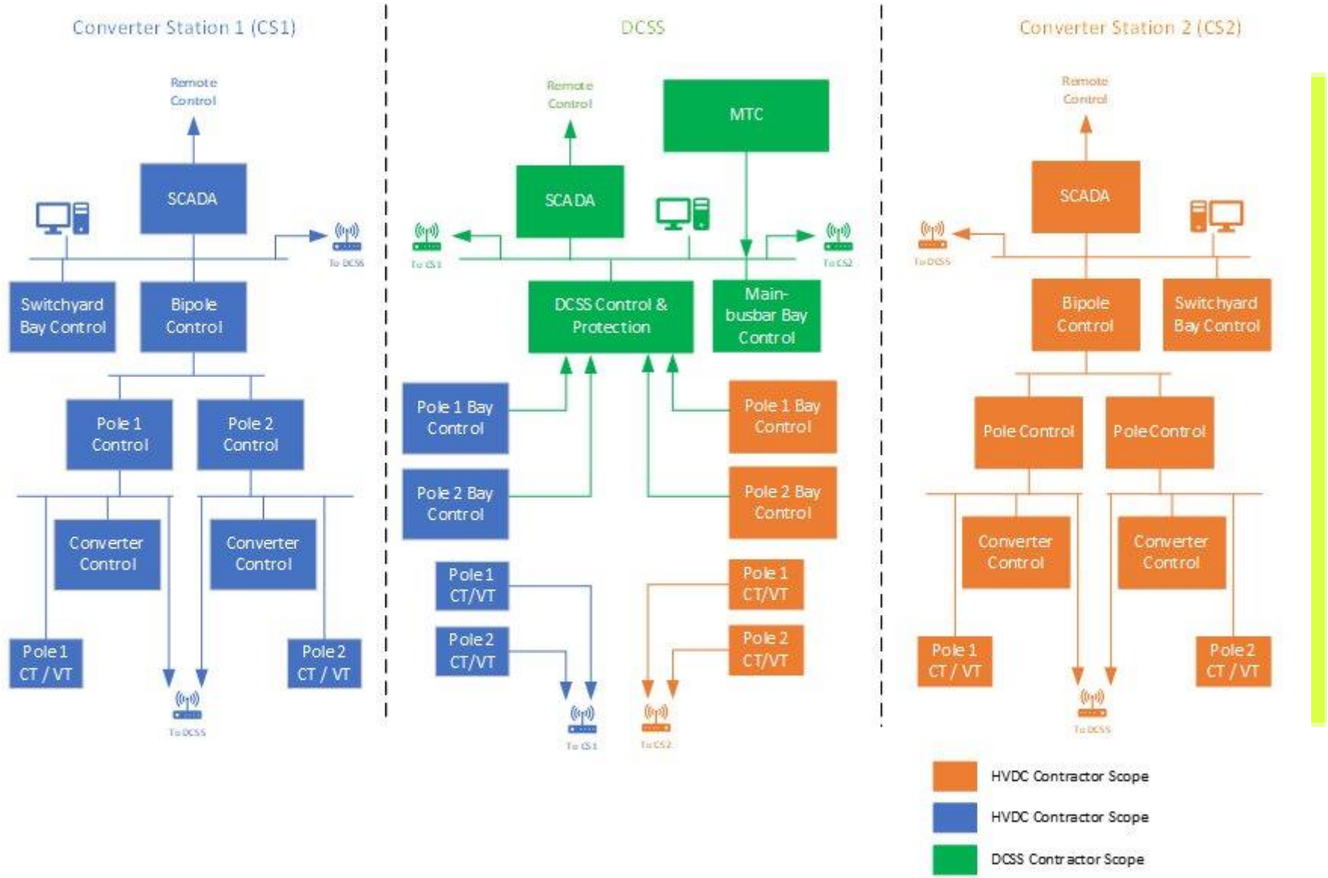

Figure 4-2: Concept for MTDC Control & Protection System

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“There is no right answer, there’s just “an” answer.

Questions?