

CIGRE Study committee B4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG B4/B1.106

NAME OF THE CONVENOR

Salimi-Schley Maryam (GERMANY)

TITLE

Guideline of VSC HVDC Converter and DC Cable Interface Management

THE WG APPLIES TO DISTRIBUTION NETWORKS: NO

ENERGY TRANSITION

5 / Grids and Flexibility

POTENTIAL BENEFIT OF WG WORK

- 1 / commercial, business, social, economic benefits
- 2 / potential interest from a wide range of stakeholders
- 3 / likely to contribute to new or revised industry standards

STRATEGIC DIRECTION

1 / The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-of-the-art technological advances

SUSTAINABLE DEVELOPMENT GOAL

- 7 / Affordable and clean energy
- 9 / Industry, innovation and infrastructure

BACKGROUND :

HVDC transmission projects have become a standard approach to exchange bulk power between power systems worldwide. Their efficiency both from a technical and commercial perspective has been proven in a vast number of realized projects and continues to be validated by the pipeline of future projects. Specifically, the introduction of VSC and its potential application for multi-terminal projects has bolstered the outlook where more and more DC projects will be contracted and commissioned.

A vast share of VSC HVDC transmission Projects is currently being realized utilizing HV cable connections. Cables offer a multitude of benefits and are sometimes the only technically viable option to realize a connection:

- Geographic conditions, particularly when the optimum route includes offshore sections
 - The associated risks relative to permitting for new overhead lines in land connections is often prohibitive for new projects
 - Cables are a proven and well-established technology that continue to offer opportunities for future transmission capacity increase by application of higher voltages
- With the increasing number of HVDC / Cable transmission projects the specific challenge of planning, establishing and operating the interface between the cable and the DC Converter emerge.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

HVDC transmission projects using cables are usually contracted in lots split between both the cable and converter vendor. Project experience shows that in view of the cable / converter interface significant effort is required as early as during the conceptual phase to capture the interface associated scopes:

- Reasonable, manageable scope boundaries must be defined.
- Shared responsibilities between both parties and the Employer must be clarified including commissioning testing.

- An extensive scope analysis must be carried out to avoid responsibility gaps
- Potential impacts on the reliability, warranties and other commercial implications emerging from the interface must be identified supported by quality management processes.
- A balanced approach to resolve conflicts emerging from the technical interfaces must be established. These must be reflected in the tender documentations to support project planning and overall risk management. Today the lack of guidelines exposes any HVDC / Cable transmission project to interface associated risks.

In subsequent project stages the interface responsibilities and activities must be executed, managed and monitored to the benefit of the entire project. Managing the converter / cable interface becomes an integral part of successful project realization.

This working group aims at benefitting from international project experience to provide insight into lessons learned and establish a technical guideline supporting the interface engineering decisions throughout the entire project life cycle.

SCOPE :

The working group aims to carry out the following tasks:

- To outline all the major interface points to be anticipated during different stages of a project with a specific set-up, i.e. DC configuration, converter topology, cable technology, etc.
- To provide an overview of the advantages and disadvantages of different project set-ups in terms of the interfaces from the potential main stakeholder's perspective.
- To analyze potential major interface associated risks and recommend mitigation strategies aimed at informed interface management decision making across all project phases.
- To discuss data exchange requirements and strategies.
- To discuss cable testing requirements, boundary conditions and project integration strategies.
- To describe and compare the different interface-related challenges for onshore and offshore installations.
- To explore strategies to manage the interface points, such as the ambient temperature at the interface point / cable termination, where the responsibilities of the Contractors usually overlap and potentially contradict.
- To provide an overview over typical signals originating from the cable monitoring system and their integration into the control and protection system of the converter station.
- To explore strategies to integrate cable sealing end monitoring solutions into the overall project scope.
- To uncover and analyze operational requirements and synergies to be accounted for during all project stages.
- To review existing and past projects and compile lessons learnt and discuss the example cases.

The working group specifically focuses on interdisciplinary work actively encouraging contributions from:

- Vendors and manufacturers
- Project developers
- TSOs and utilities
- Project consultants
- Permitting / Consenting experts

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee

Future connections

Technical Brochure and Executive Summary in Electra

Tutorial

Webinar

Time schedule

- | | | |
|----|------|---|
| Q4 | 2025 | • Recruit members (National Committees, WiE, NGN) |
| Q2 | 2026 | • Develop final work plan |
| Q1 | 2028 | • Draft TB for Study Committee Review |
| Q1 | 2029 | • Final TB |
| Q2 | 2029 | • Tutorial |
| Q2 | 2029 | • Webinar |

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S. J Loken
November 27th, 2025