

CIGRE Study committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG C4/B1/B2/B4.78

NAME OF THE CONVENOR

Mohammad Nazemi (GERMANY)

TITLE

Interference effects between HVDC circuits and nearby metallic infrastructure

THE WG APPLIES TO DISTRIBUTION NETWORKS: YES

ENERGY TRANSITION

5 / Grids and Flexibility

POTENTIAL BENEFIT OF WG WORK

- 1 / commercial, business, social, economic benefits
- 3 / likely to contribute to new or revised industry standards
- 4 / state-of-the-art or innovative solutions or directions
- 5 / Guide or survey on techniques, or updates on past work or brochures
- 6 / work likely to contribute to improve safety

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
- 2 / Making the best use of the existing systems
- 3 / Focus of the environment and sustainability (in case the WG shows a direct contribution to at least one SDG)

SUSTAINABLE DEVELOPMENT GOAL

9 / Industry, innovation and infrastructure

BACKGROUND :

Overhead transmission lines or underground cables can induce voltages on metallic infrastructure like pipelines, fences and telecommunication lines located in their vicinity because of the capacitive, inductive, and conductive coupling between them.

This issue has been carefully studied in the case of AC-interference in [1]-[2] under steady state and fault conditions. In addition, the inductive coupling due to harmonics of DC systems, especially on parallel telephone lines has also been studied in [3]. However, a general study about interference between HVDC circuits and parallel infrastructure (DC-Interference) has not been widely investigated to date. The focus of this work should be mainly on safety issues.

Unlike AC-systems, DC-systems do not typically induce interference under normal operation (apart from harmonics), as the direct current (DC) has a very small deviation over the time, resulting in no alternating magnetic field. However, during transient conditions an interference between DC-systems and parallel buried infrastructures is expected. Current standard approaches for calculating and assessing the AC-interferences (under fault condition) are not applicable for DC-Interferences between HVDC systems (HVDC Cables as well as HVDC OHLs) and parallel buried pipelines. A methodology for the calculation and evaluation of DC-Interference needs to be developed. The calculation must be conducted in the time domain simulation to properly consider the complexity of the couplings. With the new approach, the minimum distance between HVDC Cable/OHL and the buried pipelines as well as the maximum length of the parallelism can be determined.

References:

[1] CIGRE TB 95, "Guide on the influence of high voltage AC power systems on metallic pipelines", 1995.

[2] CIGRE TB 290, "AC corrosion on metallic pipelines due to interference from AC power lines", 2006.

[3] CIGRE TB 811, "DC side harmonics and filtering in HVDC transmission systems", 2020.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

The primary goal of the joint working group is to study the interference effects between HVDC transmission circuits and neighbouring metallic infrastructure and, if necessary, propose measures to prevent negative consequences on these surrounding infrastructures as well as on the considered DC transmission circuit. The focus of the work should be mainly on safety issues. The working group shall also review the international relevant regulatory context and identify potential gaps.

SCOPE :

The scope of work includes the following topics:

- Review of existing literature related to DC-interference with nearby metallic structures (e.g. pipelines, fences and telecommunication lines) and highlight the differences or similitudes between AC and DC-interferences.
- Problem statement: focus on the interference effects between HVDC circuits and nearby metallic infrastructure; cause and effects.
- Clarification of the regulatory context related to DC-interference.
- Development of calculation methodologies (and measurements methods) for DC-Interference.
- If necessary, presentation of mitigation and protection measures for DC-Interference.

Remarks:

It should be noted that scope of this JWG is limited to interference caused by electro-magnetic coupling. Ground current conductive interference effects will be addressed in a separate WG.

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee

Electra report

Technical Brochure and Executive Summary in Electra

Tutorial

Webinar

Time schedule

Q4 2025 • Recruit members (National Committees, WiE, NGN)

Q1 2026 • Develop final work plan

Q1 2029 • Draft TB for Study Committee Review

Q1 2029 • Tutorial

Q1 2029 • Webinar

Q2 2029 • Final TB

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S. J. Loken

August 11th, 2025