

CIGRE Study committee D1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG D1.85

NAME OF THE CONVENOR

Hyrenbach Maik (GERMANY)

TITLE

Impact of new insulating gases on tightness of gas-insulated systems, leakage testing and conversion factors

THE WG APPLIES TO DISTRIBUTION NETWORKS: YES

ENERGY TRANSITION

4 / Sustainability and Climate Change

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

5 / Guide or survey on techniques, or updates on past work or brochures

STRATEGIC DIRECTION

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 :

Today's standards covering gas tightness requirements and respective testing of gas-insulated systems are based on five decades of applying pure SF₆, which is easy to detect and requires high gas tightness, due to its high global warming potential. More sustainable alternatives are applied in gas-insulated systems today, particularly natural-origin gases along with mixtures with fluorinated components. Most alternatives to SF₆ are applied as gas mixtures, which adds complexity in terms of different permeation and leakage rates dependent on the components of the gas mixture. Furthermore, different gases and pressures than the original gas mixture are used to conduct leakage tests (added as tracer gas in lower percentage or pure at 100%), which requires conversion of leakage rates between the tracer gas and the insulation gas mixture used.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

The purpose of the WG is to give technical guidance in terms of tightness requirements along with required testing methodology and leakage rate conversion, when other insulating gases are used as alternatives to SF₆.

SCOPE :

The Working Group will collect and summarize the current knowledge on permeation and leakage of gas-insulated systems when alternatives to SF₆ are used, along with the impact on gas tightness and mixing ratio requirements. Furthermore, it will provide guidance about required testing, particularly how to determine leakage rates when gases and pressures different to the original gas mixture are used for testing purposes.

- Review of standard requirements on leakage testing
- Description of physical basics
- Properties of typical sealing materials and principles how to determine it

- Impact of SF₆ alternative gases on tightness requirements and respective testing
- Conversion of leakage rates dependent on the gas mixture and pressure from leakage rates measured with tracer gases in routine and type tests
- Determination of maximum permitted helium leakage rates for routine test

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee
Electra report
Technical Brochure and Executive Summary in Electra
Tutorial

Time schedule

- | | | |
|----|------|---|
| Q3 | 2026 | Recruit members (National Committees, WiE, NGN) |
| Q4 | 2026 | Develop final work plan |
| Q4 | 2028 | Draft TB for Study Committee Review |
| Q2 | 2029 | Final TB |
| Q3 | 2029 | Tutorial |
| Q3 | 2029 | Webinar |

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig Loken
March 27th, 2026