CIGRE Study Committee D1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG N° D1.78	**Name of Convenor:** WALTER, Michael (Switzerland) **E-mail address**: walter@fkh.ch
Strategic Directions #[2]: 3	**Sustainable Development Goal #[3]: 12**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4]: 3	
Title of the Group: Partial discharge properties of non-SF_6 insulating gases and gas mixtures	

Scope, deliverables and proposed time schedule of the WG:

Background:

SF_6 gas is still the predominant solution for compact and reliable gas-insulated systems, but with the disadvantage of a high global warming potential. The demand for more climate friendly alternatives is increasing. Recent developments presented solutions based on either natural-origin gases or their mixtures with halogenated components. While the insulation performance of non-SF_6 insulating gases was subject of previous CIGRE WGs (D1.51 / TB 730, D1.67 / TB 849), more focus on the partial discharge (PD) properties and its impact on the insulation is required, as the PD properties are dependent on gas, gas mixture and gas pressure. PD measurement techniques are essential instruments to detect typical imperfections like protrusions and particles in the gas and at insulator surfaces, finally to assess the integrity of gas-insulated systems within the entire life cycle.

Scope:

The Working Group will collect and summarize the current knowledge on the PD properties of major natural-origin and fluorinated non-SF_6 insulating gases and gas mixtures which are currently proposed by the equipment manufacturers. Wherever required and feasible, further studies shall be conducted (e.g. by testing).

- Review of physical PD basics and current PD measurement techniques (conventional and UHF)
- Definition of appropriate test setups and detailed description of measurement procedure
- Tests and test results, esp. PD inception and breakdown voltage
- Impact of gas mixture on PD impulse waveforms, frequency spectra and phase-synchronous patterns in the typical pressure range of HV (and optional MV) equipment in comparison to SF_6
- Applicability of current PD measurement techniques for non-SF_6 insulating gases
- Estimation of the detectability of critical imperfections
- Gas decomposition by PD, its measurement and potential impact on electric properties

Deliverables:

☒ Technical Brochure and Executive Summary in Electra
☐ Electra Report
☐ Future Connections
☐ CSE
☒ Tutorial

☐ Webinar **Time Schedule**: start: January 2023 **Final Report**: January 2026
Approval by Technical Council Chairman: **Date**: January 6th, 2023

Notes: [1] Working Group (WG) or Joint WG (JWG), [2] See attached Table 1, [3] See attached Table 2 and CIGRE reference Paper: Sustainability – at the heart of CIGRE's work. [4] See attached Table 3

Table 1: Strategic directions of the Technical Council

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 on the environment and sustainability (in case the WG shows a direct contribution to at least one SDG)
4	Preparation of material readable for non-technical audience

Table 2: Environmental requirements and sustainable development goals

	CIGRE selected the 7 SDGs that are the most relevant to CIGRE. In case the WG work refers to other SDGs or do not address any specific SDG, it will be quoted 0.
0	Other SDGs or not applied
7	**SDG 7: Affordable and clean energy** Increase share of renewable energy; e.g. expand infrastructure for supplying sustainable energy services; ensure universal access to affordable, reliable, and modern energy services; energy efficiency; facilitate access to clean energy research and technology
9	**SDG 9: Industry, innovation and infrastructure** Facilitate sustainable infrastructure development; facilitate technological and technical support
11	**SDG 11: Sustainable cities and communities** Increase attention on sustainable and resilient buildings utilizing local (raw) materials, power for electric vehicles, strengthening long-line transmission and distribution systems to import necessary power to cities, developing micro-grids to reinforce the sustainable nature of cities; protect and safeguard the world's cultural and natural heritage; reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and waste management
12	**SDG 12: Responsible consumption and production** E.g. Promote public procurement practices that are sustainable; address reducing use of SF6 and promote alternatives, encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle, address inefficient fossil-fuel subsidies that encourage wasteful consumption
13	**SDG 13: Climate action** E.g. Increase share of renewable or other CO_2-free energy; energy efficiency; expand infrastructure for supplying sustainable energy; strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; integrate climate change measures into national policies, strategies and planning; improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
14	**SDG 14: Life below water** E.g. Effects of offshore windfarms; effects of submarine cables on sea-life
15	**SDG 15: Life on land** E.g. Attention for vegetation management; bird collisions; integration of substations and lines into the landscape

Table 3: Potential benefit of work

1	Commercial, business, social and economic benefits for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical directions
5	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
6	Work likely to contribute to improved safety.

Comments:

1) CIGRE Official Study Committee Rules: WG Membership

https://www.cigre.org/GB/about/official-documents

a. Only one member per country (by exception of SC Chair)

b. WG nominees must first be supported by their National Committee (or local SC Member) as an appropriate representative of their country.

c. Acceptance of the nomination is granted by the SC Chair and advised to the WG Convener

2) Collaboration Space

https://www.cigre.org/article/GB/collaborative-tools-2

CIGRE will provision the WG with a dedicated Knowledge Management System Space.

The WG will use the KMS for drafting collaboration, capture and retention of discussion and meeting records.

Official country WG Members will be sent registration instructions by the Convener.

Official country WG Members may request the WG Convener to allow additional access for an extra national subject matter specialist to aid in the work at the national level, including NGN members.