

CIGRE Study Committees A2 and D1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG ¹A2/D1.71	Name of Convenor: Lars LIDEN (SWEDEN) E-mail address: lars.liden@hitachienergy.com
Strategic Directions #²: 1	Sustainable Development Goal #³: 9
The WG applies to distribution networks: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	
Potential Benefit of WG work #⁴ : 3	
Title of the Group: Modern Insulating Liquids Qualification for OLTC, Bushings and other accessories.	
Scope, deliverables and proposed time schedule of the WG: Background: <p>Insulating liquids used in electrical equipment such as, tap-changers, bushings and accessories must fulfil various requirements, such as electrical insulation, heat transfer, lubrication, arc-quenching, material compatibility or buoyancy. Existing equipment has been designed and optimized for mineral insulating oil, and standards like IEC 60296, ASTM D3487 or comparable were established which determine several basic properties of the liquid. Standards for alternative liquids, such as for natural esters, synthetic esters or silicone liquids have been derived from the mineral oil standards, specifying the same liquid parameters as for mineral oil and miss to represent deviant properties of these liquids.</p> <p>Currently, many new insulating liquids are entering the market. There are new synthetic and natural esters, plus new oils according to IEC60296, made from natural gas (GTL oils) or from renewable hydrocarbons, instead of petroleum. They partially show a different performance in the respective equipment, in terms of all above mentioned requirements.</p> Purpose/Objective/Benefit of this work: <p>In order to evaluate and approve new insulating liquids, equipment manufacturers are forced to develop individual test procedures and approval processes for their equipment, due to the current standards do not provide sufficient information to allow a data-sheet-based evaluation. They primarily define quality parameters of the liquids, but less their performance in electrical equipment. It is therefore desirable to identify <u>all</u> performance-relevant parameters for the various equipment and to define appropriate test methods, which are easy to apply. The different test strategies pursued by the different equipment manufacturers should be harmonized, and generally accepted methods should be brought to standardization. There is further a need for a common understanding how to test new liquids in a way so that they become comparable.</p> Scope: <p>The proposed scope of work will be as follows:</p> <ol style="list-style-type: none"> 1. Identify all performance-relevant parameters of insulating liquids for different electrical equipment, such as on-load and de-energized tap-changers, bushings, and accessories with permanent oil contact, such as Buchholz relays, oil level indicators, oil-flow relays, oil-flow indicators, temperature sensors. 	

2. Literature Study:
3. Identify all relevant existing standards which are currently incomplete to represent the parameters identified in 1.
4. Collect the manufacturer-specific test methods, test arrangements and strategies for the approval of new insulating liquids. Achieve a common understanding and shape agreed test methods with test arrangements which represent the real construction and function of the equipment and which are easy to apply.
5. Identify or develop appropriate test methods and arrangements to evaluate the lubrication and arc-quenching behaviour of tap-changers and which are easy to apply.
6. Prepare standardization of the identified and agreed methods.

Remarks:

- CIGRE paper 11066_2022 (A2-PS2) - *Qualification of Insulating Liquids for Power Transformers and Tap-Changers* – shows all open issues for power transformers and tap-changers, missing limit values and missing test procedures.
- CIGRE Brochure TB856 - *Dielectric performance of insulating liquids for transformers* – already addresses the need for practically accepted test setups to evaluate the dielectric behavior.
- IEC TC14 TR60076-26 *Functional Requirements of Insulating Liquids* – gives an overview on due standards revision to allow an overall evaluation of modern insulating liquids.

Deliverables:

- Annual Progress and Activity Report to Study Committee
- Technical Brochure and Executive Summary in Electra
- Electra Report
- Future Connections
- CIGRE Science & Engineering (CSE) Journal
- Tutorial
- Webinar

Time Schedule:

- | | |
|---|---------|
| • Recruit members (National Committees) | Q3 2023 |
| • Develop final work plan | Q1 2024 |
| • Draft TB for Study Committee Review | Q2 2026 |
| • Final TB | Q3 2026 |
| • Tutorial | Q3 2026 |

Approval by Technical Council Chairman:**Date:** July 17th, 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

WG Membership: refer Comments at end of document

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.