CIGRE Study Committee B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° B1.89	**Name of Convenor:** Bent Thomas Denis (NORWAY)
Strategic Directions #[2]: 2	**Sustainable Development Goal #[3]:9**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4] : 1,3,5,6	
Title of the Group: Guidance for conducting cable systems failure analysis	

Scope, deliverables and proposed time schedule of the WG:

Background:

MV/HV cable systems are usually designed for a long lifespan and are generally used where high network reliability is required. Whenever a failure occurs, knowledge of the cable system failure cause is vital to settle costs, insurance and/or claims, to get insight in risks and safety concerns related to similar installations and restore trust in the reliability of the cable system. However, possibly the most important value of knowing the failure cause relates to the possibility for improvement and avoid reoccurrence of the failure in similar or future systems. Whether it is about aged or new cable systems, accurate fault analysis is essential for continuous improvement in network performance and reliability, as it provides important information on where in the complete life cycle (engineering, design, production, transportation, installation, testing, operation, maintenance) improvement or replacement is needed, and how. However, these values all only contribute in case the actual root cause of the failure is identified with sufficient reliability, which requires a cable system failure analysis of sufficient quality and completeness in an unbiased way.

What is currently observed is that failure analyses are carried out with varying degrees of quality and completeness by various parties, like utility staff, manufacturers and consultants. There is currently no CIGRE reference material that provides guidelines and/or advises on best practice for cable system failure analysis. The recent publication of TB735 Transformer Post-Mortem Analysis can provide a guideline.

A proposed WG aims to provide guidelines for a standardized, systematic, accurate and comprehensive approach for performing cable system fault analysis.

Scope:

It shall not be the intention of the proposed WG document to provide detailed tests to identify a root cause as this would be an effort going beyond the scope of the WG. The aim is to provide a framework or a roadmap of areas that should be addressed, leaving the detail to the investigation team.

1) Coverage of the Proposed WG (Cable System)
   a) Voltage (MV-EHV) shielded designs > 5kV to 800kV
   b) AC and DC Systems – cables, accessories, ancillaries, and hydraulic equipment
   c) All Land and Subsea cable designs including Extruded, SCLF, Pipe-type, PILC, MI

Notes: - The Scope will not include High Temperature Super Conducting (HTSC) cable systems, Gas Insulated Lines (GIL)

- Monitoring equipment of cable systems (DTS, DAS …) will be discussed from a user point of view.

2) Review of Literature

3) Failure Related System Information/Sequence of Events (Asset) such as
Date & Time of fault, load and fault current, duration of fault and load pattern and other pertinent data regarding fault finding and maintenance records

4) The impact of Fault Finding/Pre-location on the failure analysis. Relevant information such as methodology, equipment, personnel to the extent as they impact the failure analysis.

5) Fault Location and Recovery. Relevant information for sample marking, condition and transport. Samples of adjacent cable and duct or pipe. Fault site location.

6) Failure Investigation including scope and requirements, equipment used, duration and required material and electrical tests. Visual investigation. Retention of samples and Reporting

7) Cable System Design Review including standards used, design parameters, and as-built information.

8) Data relating to QA/QC cable and accessories parameters, Manufacturing and Testing traceability, transportation and installation traceability are currently investigated by WG B1.76. A future WG B1.89 will point to the to be developed B1.76 Technical Brochure where appropriate. Where such data is not available WG B1.89 will include such information.

Taskforce recommendation:

All members of Taskforce B1.89 recommend to initiate a new Working Group B1.89 to develop *Guidance for conducting cable systems failure analysis*.

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:

Start: Q4 2022 **Final Report**: Q4 2025

Approval by Technical Council Chairman:

Date: January 5th, 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.