CIGRE Study Committee B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° B1.90	**Name of Convenor:** Rachel Mosier (US)
Strategic Directions #[2]: 1,2	**Sustainable Development Goal #[3]: 7,13**
The WG applies to distribution networks: ☐ Yes / ☒ No	
Potential Benefit of WG work #[4] : 1,3	
Title of the Group: Cable Systems Electrical Characteristics (Update TB 531)	

Scope, deliverables and proposed time schedule of the WG:

Background:

The existing Cigre TB 531 "Cable Systems Electrical Characteristics" provides guidance for calculating sequence impedances of a wide range of power cables. Since the brochure was produced, the volume of submarine cables being installed has increased dramatically due to the growth of renewable power generation, primarily from offshore wind.

Recent experience (documented in a Danish/Swedish paper synopsis submitted to the Cigre Session 2022), has shown that the existing TB 531 does not fully meet the needs of the offshore wind community. This is mainly due to the use of a wider range of submarine cables than were considered in the original TB. Specific examples where problems have been encountered include:

- There is a need to calculate positive sequence impedance calculations for higher frequencies to support power system modelling studies. It is not clear if the methods in Section 4.2.3 are applicable or sufficiently accurate for this purpose.
- Zero sequence formulae for submarine cables need to be improved, eg in Table 12 the armour layer is not included in the formulas (despite the fact that it is a significant part of the return path).
- It is not clear if the influence of the magnetic armour of a submarine cable is correctly accounted for.
- It would be valuable to have step by step guidance on the alternative methods described in the appendices.

Issues such as those described above make it difficult to compare impedance data between different suppliers, and changes in the calculated sequence impedances can have a large impact on other areas of the electrical system design.

Scope:

1. Review the existing TB 531 and identify any gaps in the recommendations, particularly with respect to submarine cables, but also considering any other areas where new or improved guidance is now available.

2. Investigate the published technical literature to identify if the gaps can be filled using existing published methods.

3. Where improvements or additions are needed to fill the gaps identified in Step 1, develop a suitable method and use knowledge and tools available within the WG to verify that it is correct.

4. Ensure that the theoretical background is sufficiently explained, adding any supporting references needed.

5. Provide a small number of worked examples to provide guidance to users.

Remarks:

The scope described above is not expected to take a full 3 years and could be undertaken by a WG with reduced size.
The WG have experts that will liaison with C4.74 ("Accurate Line and Cable Models for Steady-State and Transient Studies") that starts now in Q4-2022, in order to not have duplication of activities.

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 2024

Approval by Technical Council Chairman:

Date: November 25th, 2022

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.