CIGRE Study Committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° C4.67	**Name of Convenor:** Alexandre Piantini (Brazil)
Strategic Directions #[2]: 2	**Sustainable Development Goal #[3]: 9**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4] : 3, 4, 5, 6	
Title of the Group: Lightning Protection of Hybrid Overhead Lines	

Scope, deliverables and proposed time schedule of the WG:

Background:

The practice of carrying more than one circuit with different rated voltages on the same tower has been used as a solution by some power companies for space and right of way saving. Such hybrid overhead lines involve sub-transmission and distribution circuits. This practice is relatively recent, especially concerning the presence of low-voltage lines, but it has great potential in reducing investments in the construction of new lines, since the transmission structures are already there. However, the proximity between the circuits might result in an increase in the number of unscheduled power supply interruptions in the medium voltage (MV) and low-voltage (LV) distribution lines, as well as damages to consumer equipment.

The analyses of the overvoltages caused by direct and indirect lightning strokes in high voltage (HV), MV, and LV lines that share the same structures, and the evaluation of the lightning performances of such lines, considering different configurations and protection methods, are topics that deserve attention and investigation.

The advantages coming from the adoption of compact distribution lines, i.e., lines typically composed of a messenger cable, polymeric spacers, and covered cables, will also be investigated. Besides, there has also been an increasing interest in hybrid configurations involving DC lines.

The working group will examine models for simulating the main components of hybrid overhead lines (tower, insulators, grounding), analyze the overvoltages associated with direct and indirect strokes, and compare the lightning performances of conventional distribution circuits (i.e., distribution lines alone) and distribution circuits of hybrid overhead lines considering different techniques for the mitigation of lightning overvoltages.

Although the main focus of the WG will be on hybrid overhead lines involving sub-transmission and distribution circuits, multi-circuit transmission lines with different rated voltages have been widely applied and will also be covered.

Scope:

1. Review of simulation models for the main hybrid overhead line components, including towers and insulators.
2. Survey of existing utility practices concerning hybrid overhead line configurations.
3. Assess the overvoltages caused by direct and indirect strokes on hybrid overhead lines with different configurations.
4. Analyse the lightning performances of distribution circuits of hybrid overhead lines considering different protection methods and make comparisons with conventional distribution circuits alone.
5. Analyse the influence on the lightning performance of buildings or other objects in the vicinity of the lines (some recent advances on this is acknowledged but work is scarce).
6. Provide guidelines for the safety of persons and the protection of equipment in LV distribution networks supplied by hybrid overhead lines.
7. Assess the lightning overvoltages on typical multi-circuit transmission lines with different rated voltages and protection methods.

Deliverables:

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

Time Schedule: start: January 2022 **Final Report**: July 2025

Approval by Technical Council Chairman:

Date: June 7th, 2021

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.