CIGRE Study Committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° C4.66	**Name of Convenor:** Megumu Miki (JAPAN)
Strategic Directions #[2]: 2	**Sustainable Development Goal #[3]:**9
The WG applies to distribution networks: ☐ Yes / ☒ No	
Potential Benefit of WG work #[4] : 5	
Title of the Group: New concept for analysis of multiphase back-flashover phenomena of overhead transmission lines due to lightning	

Scope, deliverables and proposed time schedule of the WG:

Background:

Lightning is one of the most important factors for evaluation of performance of transmission lines. Shielding failure and back-flashover are two important events to assess lightning performance of transmission lines. As to shieling characteristics of transmission lines, an electro-geometric model, what we call A-W model, has been used worldwide. Recently, a model which considers dynamic development of a downward leader and upward leaders, which is called leader development model, has been investigated by many researchers and lots of papers have been published.

Usually, shielding failure does not generate multiphase flashover of a transmission line and it is not a serious problem for reclosing the line. In the case of back-flashover, however, multiphase flashover sometimes occurs, and it can cause a serious problem to the transmission system. Though there are some reports on multiphase back-flashover, they have not been studied in detail so far. Instead, a simple model has been used for the estimation of multiphase flashover occurrence. One of the reasons of this situation may be that it is necessary to understand the flashover characteristics in a parallel gap configuration to analyse the multiphase back-flashover phenomena. Furthermore, lightning arresters have been installed on transmission lines in these days and it is not an easy task to analyse multiphase back-flashover phenomena precisely on such conditions. Though there are experimental and theoretical studies of flashover characteristics in a parallel gap configuration, they are not applied to any evaluation program of lightning performance of transmission lines yet.

Scope:

Considering the studies already carried out, this working group will focus on the items shown below.

1) Review of statistical data of lightning outages of transmission lines in many countries.

2) Review of algorithms of calculation programs of a transmission lightning outage rate used in practice, especially on the treatment of multiphase flashover.

3) Review of experimental and theoretical studies of flashover characteristics in parallel gap configurations.

4) Proposal of a novel algorithm to estimate multiphase back-flashover occurrence and its application to a calculation program for evaluation of lightning performance of transmission lines.

Deliverables:

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

Time Schedule: start: October 2021 **Final Report**: October 2024

Approval by Technical Council Chairman:

Date: May 4th, 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.