CIGRE Study Committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° C4.57	**Name of Convenor: Koji Michishita (JAPAN)**
Technical Issues #[2]: 10	**Strategic Directions #[3]: 2**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 5	
Title of the Group: Guidelines for the Estimation of Overhead Distribution Line Lightning Performance and its Application to Lightning Protection Design	

Scope, deliverables and proposed time schedule of the WG:

Background:

Damage due to lightning is one of the most serious problems in overhead distribution lines (OHDL). Some countermeasures such as use of shielding wire(s), introduction of surge arresters and reduction of grounding resistance are commonly employed in OHDL lightning protection. Since the use of OHDL is very wide, it is not practical to apply countermeasures to every single pole. Besides, the design of OHDL is greatly dependent on the country it is used and the population density. Furthermore, insulation level of the OHDL is relatively low in comparison with that of the overhead transmission line (OHTL). Therefore, it is impossible to protect the OHDL against all the lightning strikes and hence, a more balanced lightning protection (LP) design for OHDL in terms of the reliability of the power supply versus the cost of the countermeasures (as the effect of the additional countermeasures depends on surroundings such as existing of tall structures) is required.

Lightning surge simulation of the OHDL considers many parameters such as the waveform of lightning current, the peak value, the lightning striking point, and the grounding resistance. The total flashover failure rate (TFFR) is considered to be a useful indicator to do an effective LP design for OHDL.

Comparison of actual TFFR with that of the calculated TFFR shows relatively good agreement. Therefore, it is accepted that the calculation of the TFFR for OHDL should be carefully carried out for various countermeasures along with the associated costs. The calculation of the TFFR for OHDL should consider the lightning characteristics around the OHDL. Data obtained through the use of the lightning location system (LLS) is frequently used to obtain lightning flash density and probability distribution of peak values of lightning current and these can be safely used for analytical purposes.

Scope:

Considering the work already carried out and detailed in CIGRE Technical Brochure 441 and 550, this working group will advance the state of the art with further:

1) Review of simulation models and calculation methods for the estimation of TFFR for OHDL.
2) Review of regional dependence of lightning characteristics for the estimation of the TFFR for OHDL.
3) Summary of the actual TFFR of OHDL with reference to the lightning characteristics around OHDL obtained by the LLS.
4) Comparison of the actual global lightning rates with calculation results.

5) Recommendation of the evaluation methods of countermeasures for the OHDL using the TFFR.
6) Provision of cost-benefit-analysis case-studies for some representative LP designs.

Liaison from SC B2 will be requested.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☐ Electra Report

☒ Tutorial[6]

☐ Webinar[6]

Time Schedule: start: September 2019 **Final Report**: December 2022

Approval by Technical Council Chairman:

Date: June 13th, 2019

Notes: [1] Working Group (WG) or Joint WG (JWG), [2] See attached Table 1, [3] See attached Table 2, [4] Delete as appropriate, [5] See attached Table 3,
[6] Presentation of the work done by the WG

Table 1: Technical Issues for creation of a new WG

1	Active Distribution Networks resulting in bidirectional power and data flows within distribution levels up to higher voltage networks
2	Digitalization of the Electric Power Units (EPU): Real-time data acquisition includes advanced metering, processing large data sets (Big Data), emerging technologies such as Internet of Things (IoT), 3D, virtual and augmented reality, secure and efficient telecommunication network
3	The growth of direct current (DC) and power electronics (PE) at all voltage levels and its impact on power quality, system control, system operation, system security, and standardisation
4	The need for the development and significant installation of energy storage systems, and electric transportation, considering the impact they can have on the power system development, operation and performance
5	New concepts for system operation, control and planning to take account of active customer interactions, and different generation types, and new technology solutions for active and reactive power flow control
6	New concepts for protection to respond to the developing grid and different generation characteristics
7	New concepts in all aspects of power systems to take into account increasing environmental constraints and to address relevant sustainable development goals.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics
9	Increase of right of way capacity through the use of overhead, underground and submarine infrastructure, and its consequence on the technical performance and reliability of the network
10	An increasing need for keeping Stakeholders and Regulators aware of the technical and commercial consequences and keeping them engaged during the development of their future network

Table 2: Strategic directions of the Technical Council

1	The electrical power system of the future: respond to speed of changes in the industry
2	Making the best use of the existing systems
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience

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.
7	Work addressing environmental requirements and sustainable development goals.