CIGRE Study Committee B2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B2.77	**Name of Convenor:** Asif Bhangor (Australia)
Strategic Directions #[2]: 1, 2, 3	**Sustainable Development Goal #[3]:** 9, 11, 13
The WG applies to distribution networks: ☒ **Yes** / ☐ **No**	
Potential Benefit of WG work #[4] : 1, 2, 3, 5, 6	
Title of the Group: Risk Management of Overhead Line networks: A model for identification, evaluation and mitigation of operational risks	

Scope, deliverables and proposed time schedule of the WG:

Background:

Transmission and distribution overhead line (OHL) networks are exposed to a range of operating risks arising from severe climatic events (wind, lightning, etc), fires, vehicle collision, component failures, ageing, and others. These events affect safe operation/maintenance of the network, reliability and customer service, public safety and environmental damage, and potentially give rise to significant financial costs to the network operators. Extreme examples of the consequences are Australian bush fire events initiated by transmission and by distribution OHL in 1983 (Ash Wednesday), also 2009 (Black Sunday) resulting in over 100 fatalities and class action pay-outs amounting to many 100s of million dollars. Examples of disruption to OHL elsewhere in the world are ice storms in Canada and Europe; severe typhoons on the Philippines in 2018; fires in California in 2018 and 2019, in Australia 2019/2020 and hurricanes on the South Eastern coast of the USA.

Risk is measured by the likelihood of an event (hazard) that may cause harm and the consequence or outcome of that event. Risk management processes can be used to model OHL assets for identification, evaluation and mitigation of operational risks.

Whilst both transmission and distribution OHL are exposed to similar hazards and consequences, the risk profile of transmission and distribution lines differs considerably. For example, distribution networks are more widespread and have a greater number of structures, and are thereby exposed to a higher hazard event likelihood e.g. vehicle impact, leaning poles, damaged cross-arms, and broken conductors etc. On the other hand, extreme weather conditions that damage transmission OHL are likely to result in a greater consequential impact on customer service and network performance, including financial impacts on the wholesale spot price.

Similarly, mitigation treatments for transmission and distribution OHL will differ reflecting the cost/benefit of treatment, opportunity costs of diverting resources from planned maintenance, and priority to restore service. Mitigation frameworks must consider various regulatory requirements, consideration of ALARP principle (as low as reasonably practicable) and hierarchical approaches to risk mitigation.

Notwithstanding the differences, many hazard events and consequences are similar, which means a common risk model can be developed applicable to both transmission and distribution OHL assets.

Scope:

The effectiveness of risk management will depend on its integration into the governance of an organisation, including decision making. Accordingly, the WG shall develop a generic risk management framework that can be customised to suit the specific needs of a power line utility.

Key objectives are to develop

- A risk model to identify hazards and likelihood of the occurrence (e.g. vulnerability assessment, failure mode analysis techniques and probabilistic modelling); assess impact (high/low probability events) and rank consequences based on risk acceptance criteria relevant to the particular utility in case of transmission and distribution separately.
- Identify and evaluate methods/treatments/actions for mitigation of risks, considering hierarchical approaches and ALARP principle.
- Guidelines (risk-based decision procedures) to assess options and selecting mitigation strategies to achieve target performance. (e.g. simple flowchart or detailed multi-criteria analysis).

Case studies will include examples of both transmission and distribution networks, e.g. risks associated with structure, conductor or conductor attachment failure, exposure to members of the public and vandalism and extreme climate events. Case studies to take cognizance of codes of practice for the design of OHL including loading criteria and considerations included therein, e.g. IEC 60826 and EN 50341.

Needs:

- Asset Operators, Technical and Asset Managers: key concerns are maintenance, vegetation management, power transfer capability, economically justifiable basis for reinforcement or upgrading of overhead line networks
- Asset Owners and Public: major concerns are reliability of OHL and security of supply, safety to the public, property and environment
- Regulators: reliability and security of supply

Reference to other Technical Brochures resp. coordination with WGs, relevant for this WG:

TB 201 Maintenance outsourcing guidelines, JWG 23/39.14 (B3/C2)

TB 422 Transmission Asset Risk Management, (C1.16)

TB 598 Guidelines for the management of risk associated with severe climatic events and Climate Change on overhead lines, (B2.54)

TB 767 Vegetation fire characteristics and the potential impacts on overhead line performance, (B2.45)

TB 645 Meteorological data for assessing climatic loads on overhead lines, (B2.28)

TB 485 Overhead line design guidelines for mitigation of severe wind storm damage, (B2.29)

TB 385 Management of risks due to load-flow increases in transmission OHL, (B2.20)

TB 350 How overhead lines respond to localized high intensity winds, (TF B2.06.09)

TB 289 Reliability based design methods for overhead lines advantages, applications and comparisons, (B2.06)

Euronorm EN 50341:2012 Overhead electrical lines exceeding AC 1 kV

IEC 60826 Overhead transmission lines - design criteria WG C2.24 Mitigating the risk of fire starts and the consequences of fires near overhead lines for System Operations WG B2.68 Sustainability of OHL conductors and fittings – Conductor condition assessment and life extension WG B2.73 Guide for Prevention of Vegetation Fires Caused by Overhead Line Systems **Deliverables:** ☒ Technical Brochure and Executive Summary in Electra ☒ Electra Report ☐ Future Connections ☐ CSE ☒ Tutorial ☐ Webinar **Time Schedule**: start: May 2020 **Final Report**: November 2023
Approval by Technical Council Chair: **Date**: May 7th, 2020

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.