CIGRE Study Committee B2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG [1]N° B2/C1.86	**Name of Convenor:** Chair (B2) Viktor Lovrenčić (Slovenia) Co-chair (C1) Yury Tsimberg (Canada)
Strategic Directions #[2]: 1-3	**Sustainable Development Goal #[3]: 9**
The WG applies to distribution networks: ☐ Yes / ☒ No	
Potential Benefit of WG work #[4]: 1-6	
Title of the Group: **Approach for Asset Management of Overhead Transmission Lines**	

Scope, deliverables, and proposed time schedule of the WG:

Background:

1. Asset Management of Overhead Transmission Lines

A transmission system consisting of a network of transmission lines is the backbone of a power system. As such, a well-planned, designed and maintained transmission network is essential for providing reliable power supply to customers.

Over the last two decades many electrical utilities have adopted Asset Management (AM) business models in pursuit of optimising value extraction from their asset base by balancing cost, risk and performance. The AM approach has shown to be an effective means of meeting stakeholder expectations while addressing regulatory challenges and staying within financial constraints.

Developing AM requirements for distribution lines presents different challenges due to their design, data availability and functional requirements and, thus, will not be addressed by this WG to manage the scope of work.

Over the last several years TSOs begun introducing Asset Management practices for overhead transmission lines (OHTLs). This enables asset managers to better manage them by optimizing their life cycles from design, construction, commission, operation, maintenance, modification, decommissioning, and disposal in the most cost-effective manner. AM techniques and methodologies also enable TSOs to improve their investment planning process by utilizing information about physical assets (“bottom up” approach) and combining it with a strategic decision-making framework (“top down” approach).

AM for OHTLs is changing rapidly, due to a variety of factors: climate change, integration of renewable resources, need for cost reduction, aging asset base, etc. New, innovative, and digital solutions are becoming available. This allows asset managers to be faster, more flexible, and agile in decision making, within a complex environment with a large variety of relevant inputs and situational business cases.

2. Challenges of OHTLs Asset Management

Despite the well-recognized benefits of AM methodologies, there are several challenges that need to be addressed to establish a mature AM process for OHTLs.

The biggest challenges have to do with:

1. OHTLs are linearly dispersed assets and different line sections of the same OHTL are exposed to different levels of stresses (proximity to industrial pollution and salinization, excessive wind, excessive ice built-up, excessive lightning), may have different construction types, e.g. lattice structures, steel poles, wood poles, as well as single-circuit or multi-circuit, and present different levels of criticality (customers supply, special locations, special loads, reliability, public exposure, inadequate clearance, system impact), so that their condition and associated risk will likely not be the same for the whole OHL.

2. An OHTL is a complex asset consisting of several components each with different service life characteristics (e.g., phase conductors, supports, overhead ground wires, optical ground wires, hardware, insulators, etc.) thus requiring evaluation at both component and asset levels.

3 There is typically scarce amount of available data and information of sometimes questionable quality obtained from various sources, e.g. foot patrols, climbing inspections, helicopter observations, drones, robots, outage data, testing results) which is often stored in not easily retrievable form (e.g. hard copies).

4. In addition to traditional “static inputs” listed above, over the last several years “near real time” inputs became available due to advances in technology and, thus, need to be included in the decision making along with the traditional “static inputs”. Examples of such near real time inputs are results from on-line monitoring, loading from SCADA, performance data from intelligent electronic devices (IEDs) and ability to access changing ambient conditions generated by external data bases.

5. De-commissioning: There is a need to continue maintaining OHTLs that are de-energized and are not used in the system to ensure that there are no safety issues associated with their mechanical failure or electrical hazards due to the induced voltage. There is a need to develop an understanding of the most cost-effective approach for dealing with such lines.

Scope:

The intent of this JWG is to recommend a consistent set of requirements for establishing AM for OHTLs, including requirements for an Asset Performance Management (APM) platform capable of extracting the data from a multitude of data sources, have functionality to process these data and generate the required information, and provide users with required outputs. The objective of the currently active WG C1.43 is to assist utilities in identifying overall requirements for such a platform without specifically defining requirements at the asset category level. This JWG will develop a set of APM requirements specifically for OHTLs.

At the same time, it is important for utilities to clearly identify what their business needs and related information needs are, before acquiring such tools, as they represent a significant investment in money, time, internal processes, and company´s culture change. This JWG will utilize to the extent possible relevant findings and recommendations from CIGRE publications and active WGs under SC B2 and SC C1 to develop a set of requirements for AM which will include but will not be limited to the following aspects:

- Developing an Asset Health Index (AHI), a criticality matrix and risk based long term plans.
- Establishing ideal data/information set needed to enable effective decision making and identify systems where such data/information could be stored.

- Enabling consistent decision-making processes for selecting appropriate actions to address identified needs.
- Identifying APM requirements for OHTL's AM.

The tasks to be addressed by the JWG are:

1. Review previously published CIGRE Technical Brochures and Green books on OHLs and extract relevant information for inclusion in the survey.

2. Design a survey and collect the survey results. The questions will be designed to cover specific areas, such as which TSOs have already established AM of OHTL and their experience, what input data are needed, what types of information should be generated, what algorithms are required, typical, desired outputs etc.

3. Identify of typical data sources of record for both "static" and "near real time" input data: on-line and in situ monitoring, Dynamic Line Rating devices, foot patrols, climbing inspections, helicopter observations, intelligent electronic devices, including the ones that may facilitate Artificial Intelligence application, robots, weather station, etc.

4. Define desired outputs and their intended usage in facilitating AM decision making in areas such as: condition management, risk management, policy development, vendor management, service provider management, reporting, compliance, Plan-Do-Check-Act loop monitoring, Life Cycle Cost analysis, end-of-life actions, de-commissioning, etc.

5. Analyse the survey results and establish a recommended set of APM tool requirements, Key Performance Indicators, AHI formulae and criticality matrices.

6. Prepare a Technical Brochure and a Webinar.

Remarks:
Reference to CIGRE Technical Brochures and Green Books with respective coordination with some WGs, relevant for this WG:

- CIGRE, TB No 175 "Management of Existing Overhead Transmission Lines", WG 22.13, December 2000,
- CIGRE, TB No 787 "ISO series 55000 standards: Implementation and information guidelines for utilities", WG C1.34, December 2019,
- CIGRE, TB No 791 "Valuation as a comprehensive approach to asset management in view of emerging developments", WG C1.38, February 2020,
- CIGRE Green Book "Overhead Lines",
- CIGRE, SC C1, Future Green Book on Asset Management expected to be completed before the end of 2021.

Deliverables:

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

Time Schedule: start: January 2022 **Final Report**: December 2024

Approval by Technical Council Chairman:

Date: December 21st, 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.