CIGRE Study Committee B.2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° B2.93	**Name of Convenor:** Dr. Janos Toth (CANADA)
Strategic Directions #[2]: 1,2,3,4	**Sustainable Development Goal #[3]: 9**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4] : 1,2,3,4,6	
Title of the Group: *Artificial Intelligence (AI) Augmented Image-Based Transmission Line Inspection and Condition Assessment*	

Scope, deliverables and proposed time schedule of the WG:

Background:

Overhead lines require significant maintenance to ensure the integrity of the components over the lifetime of the lines. Maintenance can be economically carried out if the conditions of the lines is well known, and preventative maintenance can ensure the minimization of unforeseen component failures, which can result in costly repairs and restoration of supply which may also have a cost impact on the utility and customer. Knowing the condition of the line requires inspection which has three major components.

1. Data collection in the form of visually inspecting the lines. This can be carried out by personnel in the field on foot patrol, surface vehicles, helicopters or image collection carried out by remotely operated vehicles such as unmanned aerial vehicles, robots running on conductors, and stationary cameras permanently installed on the line.
2. Evaluation of the collected information, images and field measurements, etc.
3. Recommendations based on the evaluated information.

Most of the evaluation and recommendations are currently carried out by human inspectors. However, the large number of images collected in the field requires automation for several reasons. The volume of images is simple impossible to evaluate by humans, there are limited number of inspectors who can evaluate the images. Furthermore, the expertise to provide recommendations based on the evaluated images is limited. There is also the ageing workforce and technical knowledge continuity is an issue in the transmission line engineering field.

Technological advancement in automated image processing and image evaluation using neural networks make it possible to develop systems that can find on the various type of images (Visual, Infrared (thermal), Ultra-violet (corona), X-ray, LIDAR, Magnetic, Multispectral etc.) deficiencies, defects and discrepancies on overhead lines.

Technology has also advanced in the area of capturing and disseminating knowledge connected to overhead line inspection, evaluation, and recommendations.

The scope of this WG comprehends:

1. to assess currently available automated inspection methodologies and processes for transmission line inspection.
2. assess management protocols and engineering processes to develop a streamlined and unified approach to ensure a cost and time efficient automated inspection system development.

Purpose/Objective/Benefit of this work:

Provide a summary of the status of currently available automated image-based transmission line inspection methodologies, technical status, capabilities and challenges.

Provide recommended asset management protocols and engineering processes to develop a streamlined and unified approach for a cost effective and time efficient automated image-based inspection system development for transmission lines.

Scope exclusion

- Data and image collection methodologies and technologies

Remarks:

- CIGRE: WG B2.52 The use of robotics in assessment and maintenance of overhead lines
- CIGRE: WG B2.74 Use of unmanned aerial vehicles UAVs for assistance with inspection of overhead power lines
- CIGRE, WG D2.52 Artificial Intelligence applications and technology in the power industry
- CIGRE WG B2.88 Guidelines for Safety of OHL Construction & Maintenance.

Deliverables:

☒ Annual Progress and Activity Report to Study Committee
☒ Technical Brochure and Executive Summary in Electra
☐ Electra Report
☐ Future Connections
☐ CIGRE Science & Engineering (CSE) Journal
☒ Tutorial
☒ Webinar

Time Schedule:

• Recruit members (National Committees)	Q4 2023
• Develop final work plan	Q1 2024
• Draft TB for Study Committee Review	Q1 2025
• Final TB	Q4 2025
• Tutorial	Q1 2026
• Webinar	Q1 2027

Approval by Technical Council Chairman:

Date: March 11th, 2024

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

WG Membership: refer Comments at end of document

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.

Comments:

1) CIGRE Official Study Committee Rules: WG Membership

https://www.cigre.org/GB/about/official-documents

a. Only one member per country (by exception of SC Chair)

b. WG nominees must first be supported by their National Committee (or local SC Member) as an appropriate representative of their country.

c. Acceptance of the nomination is granted by the SC Chair and advised to the WG Convener

2) Collaboration Space

https://www.cigre.org/article/GB/collaborative-tools-2

CIGRE will provision the WG with a dedicated Knowledge Management System Space.

The WG will use the KMS for drafting collaboration, capture and retention of discussion and meeting records.

Official country WG Members will be sent registration instructions by the Convener.

Official country WG Members may request the WG Convener to allow additional access for an extra national subject matter specialist to aid in the work at the national level, including NGN members.