

CIGRE Study committee B2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B2.102

NAME OF THE CONVENOR

Fan Jianbin (CHINA)

TITLE

Operational experience and guidance for robotics in transmission line inspection and maintenance

THE WG APPLIES TO DISTRIBUTION NETWORKS: YES

ENERGY TRANSITION

- 3 / Digitalization
- 4 / Sustainability and Climate Change
- 5 / Grids and Flexibility

POTENTIAL BENEFIT OF WG WORK

- 1 / commercial, business, social, economic benefits
- 3 / likely to contribute to new or revised industry standards
- 4 / state-of-the-art or innovative solutions or directions
- 5 / Guide or survey on techniques, or updates on past work or brochures
- 6 / work likely to contribute to improve safety

STRATEGIC DIRECTION

- 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
- 3 / Focus of the environment and sustainability (in case the WG shows a direct contribution to at least one SDG)

SUSTAINABLE DEVELOPMENT GOAL

- 7 / Affordable and clean energy
- 9 / Industry, innovation and infrastructure

BACKGROUND :

CIGRE TB 731 (2018) established the baseline for robotics in overhead line maintenance, defining terminology and identifying key drivers such as safety and efficiency. Additionally, WG B2.74 (Use of unmanned aerial vehicles (UAVs) for assistance with inspection of overhead power lines) provided detailed technical guidance specifically for aerial inspection workflows. At the time of these foundational works, adoption was primarily limited to a few major utilities.

Since 2018, the landscape has changed rapidly. In addition to the proliferation of robotic platforms—such as more capable Unmanned Aerial Vehicles (UAVs), conductor-crawling robots, and stationary dock stations—a new generation of advanced sensors and payloads has become available. These include high-resolution LiDAR, multi-spectral cameras, and specialized diagnostic probes. Combined with AI-driven defect recognition, these technologies have transitioned from experimental to routine operational tools. Furthermore, heavy-lift UAVs and specialized maintenance robots now perform complex tasks—such as strand repair and insulator cleaning—under live-line conditions.

With the market for inspection robotics projected to grow significantly by 2034, there is an urgent need to consolidate international field evidence, benchmark performance, and translate dispersed operational lessons into standardized guidance.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

Purpose:

To systematically collect and synthesize global operational experience with robotics for transmission line inspection and maintenance, building upon the foundations of TB 731 and B2.74 to provide actionable field guidance.

Objectives:

- Establish a framework to capture and compare field performance across various robot types, tasks, and operating conditions.
- Compile a global registry of representative in-service deployments and operating models.
- Identify best practices, key operational constraints, and recurring failure modes.
- Develop practical guidance for technology selection, workflow integration, and performance verification.
- Prioritize needs and provide clear inputs for future international standardization (IEC).

Benefits:

This work will provide TSOs, utilities, and vendors with a structured body of evidence to reduce operational risks, improve maintenance efficiency, and accelerate the reliable adoption of robotic solutions.

SCOPE :

The Working Group will survey current practices and operational experience for UAVs, line-travelling robots, and diagnostic/maintenance tools. Key activities include:

1. **System Classification & Survey:** Map international deployments by platform type (aerial, line-travelling, insulator-attached), control mode (manual to autonomous), and deployment method.
2. **UAV Inspection Systems:** Assess use cases for multirotor and fixed-wing systems, automated hangars, and AI-enabled defect detection, focusing on end-to-end safety and procedures.
WG B2.74 'Use of unmanned aerial vehicles (UAVs) for assistance with inspection of overhead power lines' will complete its work in November 2026 and its TB will be published beginning of 2027. Nevertheless, to avoid duplication, the following topics are explicitly excluded from this item and deferred to B2.74: UAV platform and payload selection guidance, collation of UAV regulatory requirements, EMC and stand-off distance rules, weather constraints, generic test requirements, and basic data-processing/defect-classification methodologies. B2.102 will use the B2.74 Technical Brochure strictly as a baseline input and will not duplicate any work that it has done.
3. **Line-Travelling Robots:** Review architectures for conductor and ground-wire robots, focusing on energy management, data exchange, and effectiveness in defect detection.
4. **Task-Oriented Maintenance Robotics:** Evaluate systems, including UAV-based and hybrid UAV-robot systems, for maintenance tasks such as strand repair, bolt tightening, spacer installation, and insulator cleaning and coating, and bird flight diverter installation, removal and replacement. Distinguish between work on energized and de-energized lines.
5. **Emergency & Post-Event Applications:** Analyze the use of robotics for de-icing and rapid damage assessment following extreme weather or seismic events.
6. **Standards & Conformity Assessment:** Analyze existing gaps in international standards and propose a roadmap for functional performance, testing, and safety rules.
7. **Technology Trends:** Assess the future impact of integrated UAV-plus-robot systems and advanced AI integration.

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee
Technical Brochure and Executive Summary in Electra
Tutorial
Webinar

Time schedule

Q4	2026	Recruit members (National Committees, WiE, NGN)
Q4	2026	Develop final work plan
Q3	2028	Draft TB for Study Committee Review
Q4	2028	Final TB
Q2	2029	Tutorial
Q2	2029	Webinar

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S. J. Loken
October 28th, 2026



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