CIGRE Study committe B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B1.105

NAME OF THE CONVENOR
Ainhirn Florian (AUSTRIA)

TITLE
Enhancing Thermal Monitoring, Dynamic Rating and Digital Integration by use of Fibre Optic Elements in Power Cable Systems

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
3 / likely to contribute to new or revised industry standards
4 / state-of-the-art or innovative solutions or directions

STRATEGIC DIRECTION
2 / Making the best use of the existing systems

SUSTAINABLE DEVELOPMENT GOAL
9 / Industry, innovation and infrastructure

BACKGROUND :
Many cable systems have already installed fibre optic elements, how to utelise this has been described in TB 756 - TB-756 - Thermal monitoring of cable circuits and grid operators' use of dynamic rating systems. The technologigal advancement has been rapid and new work needs to address several technical gaps across key areas.

In terms of digital integration, there is a lack of interoperability between digital twins, SCADA/EMS systems, and monitoring platforms, along with limited use of AI-based forecasting in operational decision-making.

Cybersecurity remains a concern due to gaps in risk management frameworks, weak access control mechanisms, and vulnerabilities in communication protocols.

Predictive analytics capabilities are currently described as limited, with insufficient guidelines and challenges related to the early detection of hot spots and anomalies, as well as the prediction of thermal ageing and degradation.

Updated case studies are needed to reflect modern infrastructure challenges, particularly in offshore wind, complex urban installations, and HVDC interconnectors. New fibre optic technologies cases should be included which could significantly improve real-time monitoring and diagnostics.

Finally, sustainability and climate resilience require more attention. There is a need for DTS-based solutions to monitor and mitigate the impacts of flooding, heatwaves, and soil degradation. Addressing these gaps will be critical for developing resilient, intelligent, and future-ready energy infrastructure.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :
Help integrate information from Fibre optic elements into the operation of the grid, such as Utilities (wind farm operators, solar, etc.), Transmission System Operators (TSOs) and Distribution System Operators (DSOs).

Input from SC C2 and SC D2 would be needed to assess how FO-based monitoring systems and their applications are to be integrated /used by grid operational centres and how to address cybersecurity topics that are specifically related to these FO-based monitoring systems and applications.

SCOPE :

The proposed work will review and update the content of TB 756, including the principles of Distributed Temperature Sensing (DTS), Distributed Acoustic Sensing (DAS), and Real-Time Thermal Rating (RTTR); cable installation methods; optical fibre integration; practical case studies; and aspects of system operation and maintenance. In addition, it will expand the scope to cover emerging areas such as digital integration with SCADA and digital twins, advanced thermal modelling techniques, cybersecurity considerations, predictive analytics for cable health, and updated case studies focusing on offshore wind, urban environments, and HVDC interconnectors. The work will also explore new fibre optic technologies and the role of thermal monitoring in enhancing sustainability and climate resilience.

- *Other monitoring solutions besides DTS to be used for dynamic rating, spot sensors, sheath current monitoring, temperature monitoring with DAS.*
- *Experiences in RTTR operations using both separate FO cable vs integrated (FIMT).*
- *Digital integration: guidelines for the use of digital twins, SCADA/EMS integration (OT/IT), monitoring platforms (dashboards), AI-based forecasting.*
- *Advanced modelling: real-time FEA, dynamic soil models, transient analysis, surrogate models*
- *Cybersecurity: risk management, access control, protocol security*
- *Predictive analytics: hot spot prediction, anomaly detection, thermal aging models, degradation models*
- *Updated case studies: focus on offshore wind, complex urban installations, HVDC interconnectors, new types of fibres (Ultra low loss, etc.)*
- *Sustainability and climate resilience: impact of extreme temperatures, flooding, and soil degradation and how DTS can be used to cope with such events*

The WG should clarify the following aspects:
- which measurements or calculated data needs to be interfaced
- characterisation of this data (binary / analog, publication frequency, etc)
- mapping of the data to IEC 61850 data objects and logical nodes
- requirements for IEC 61850 digital interface for DTS and RTTR equipment.

DELIVERABLES AND EVENTS

Deliverables Types

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

Time schedule

Q1	2026	Recruit members
Q1	2026	Develop workplan
Q2	2028	Draft TB for SC review
Q1	2029	Final TB for publication
Q1	2029	Approved Tutorial

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S. J. Loken
January 19th, 2026