

CIGRE Session 2026

Key-take aways from B2- Overhead lines



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Preferential subjects

- **PS1: OHL Modernization and Emerging Technologies – 50x papers**
 - *Theme 1.1:* Upgrading or upgrading existing lines (conductor replacement, tower modifications, foundation reinforcement).
 - *Theme 1.2:* Accelerating the design and construction of new lines to reduce costs and ease labor shortages.
 - *Theme 1.3:* Preassembled components and unmanned/manless installation methods.
- **PS2: Health Assessment and Refurbishment of OHL – 40x Papers**
 - *Subtopic 2.1:* Remaining asset life, life extension, and refurbishment strategies.
 - *Subtopic 2.2:* Reducing operation and maintenance (O&M) costs while evaluating durability.
 - *Subtopic 2.3:* Condition monitoring, predictive maintenance, and digital twins.
- **PS3: Sustainability and Climate Change Impacts – 28x papers**
 - Focused on grid resilience against severe weather events, environmental constraints, and adapting overhead line engineering to changing climatic loads and lower-carbon footprints.

118 papers in total!

Seven papers from NSC B2 the Netherlands

- 10285_B2_PS1_HORST_NL; Standard 380kV lattice steel tower within the Netherlands
- 10286_B2_PS1_LOMMERS_NL, Refined Clearance Assessment of Overhead Lines Combining LiDAR, Climate Data, and PLS-CADD Finite Element Analysis
- 10288_B2_PS1_TANNEMAAT_NL, Improved calculations for external clearances on overhead lines
- 10289_B2_PS1_STOOP_NL, Development and application of hourly values for the static rating of high-voltage overhead lines
- 10290_B2_PS2_TANNEMAAT_NL, Monitoring of overhead lines using the optical fiber in OPGW
- 10291_B2_PS3_BORGER_NL, Changing Ice and Wet Snow Loads for Overhead Lines (OHLs) in the Netherlands in relation to climate change
- 10292_B2_PS3_PLATENKAMP_NL, Study on impact downburst events on Overhead Lines (OHLs) in the Netherlands in relation to climate change

Trends

- Digitalization and AI
- Increase use existing lines
- Sensoring and smart components
- Safety
- Climate resilience
- More Indian and Chinese suppliers



Picture: Hibot inspection robot for Terna (TSO Italy)

KTA papers

B2_PS1_10110_BE CAN_2026

OTL BIM in Practice: From Design and Construction Towards Future Integration into Operation and Maintenance Processes

Design and routing of OH line was performed by integrating BIM models in several stages of the OHL construction

Next to Design software (PLSCADD) and 2D site plans, 3D model with Lidar point were used in the field check early with possible clashes

The Model can also be used during the several stages of the construction



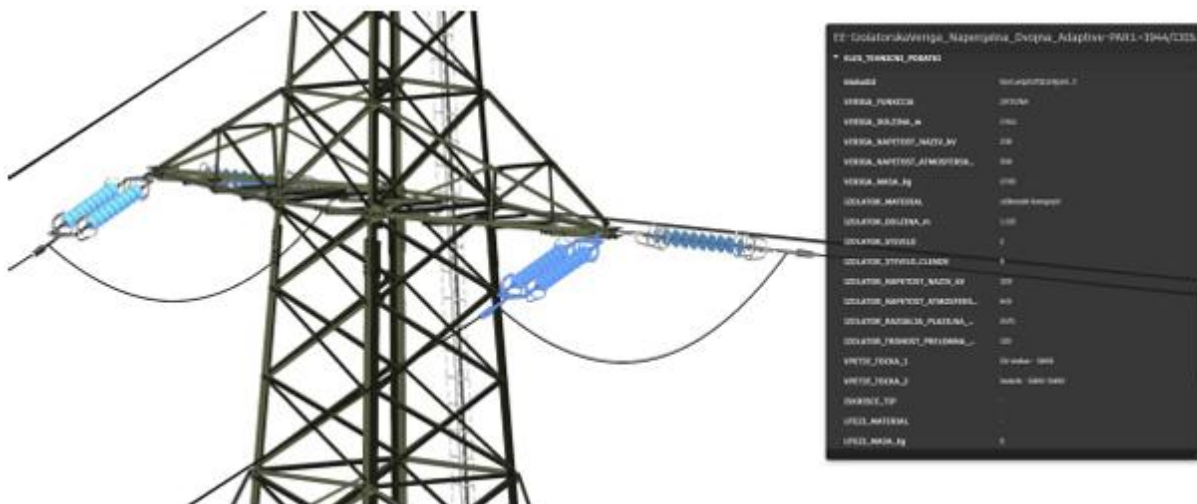


Figure 5: Accessing asset data through BIM model elements.

Complete 3D models including tower, insulator strings, foundation and conductors

New towers are assessed by Lidar and checked to the BIM model

Complete set of models will be transferred to Asset department and will be used for maintenance operations



Figure 8: Comparison of 360° photo and BIM model in CDE.

Paper B2_PS1_11620_HIGBEE_2026

Static Line Uprating: In-situ Modification of Overhead Conductor Properties for Continuous Capacity Enhancements and Synergy with Dynamic Line Ratings

Approach	Principle	Typical Capacity Increase
SLR (Static Line Rating)	Fixed rating based on worst-case weather assumptions	Baseline
SLU (Static Line Uprating)	Spectrally Selective Coating (SSC) reduces solar heating and increases thermal cooling	+21% ampacity increase (775 A → 939 A) 
DLR (Dynamic Line Rating)	Real-time rating based on actual weather conditions	+24% average rating increase in CAISO studies 
C-DLR (DLRU: Combined DLR + SLU)	Dynamic ratings combined with coated conductors	+66.8% average network capacity uplift vs. SLR 



Figure 1 - Robotic application for in-situ SSC deployment.

Increase of SLR of existing conductor can be significantly increased by applying coating and DLR

B2_PS1_10324_WILLIAMS_2026

Aim-Guide-Lock self-alignment system for tower erection avoids work under suspended load

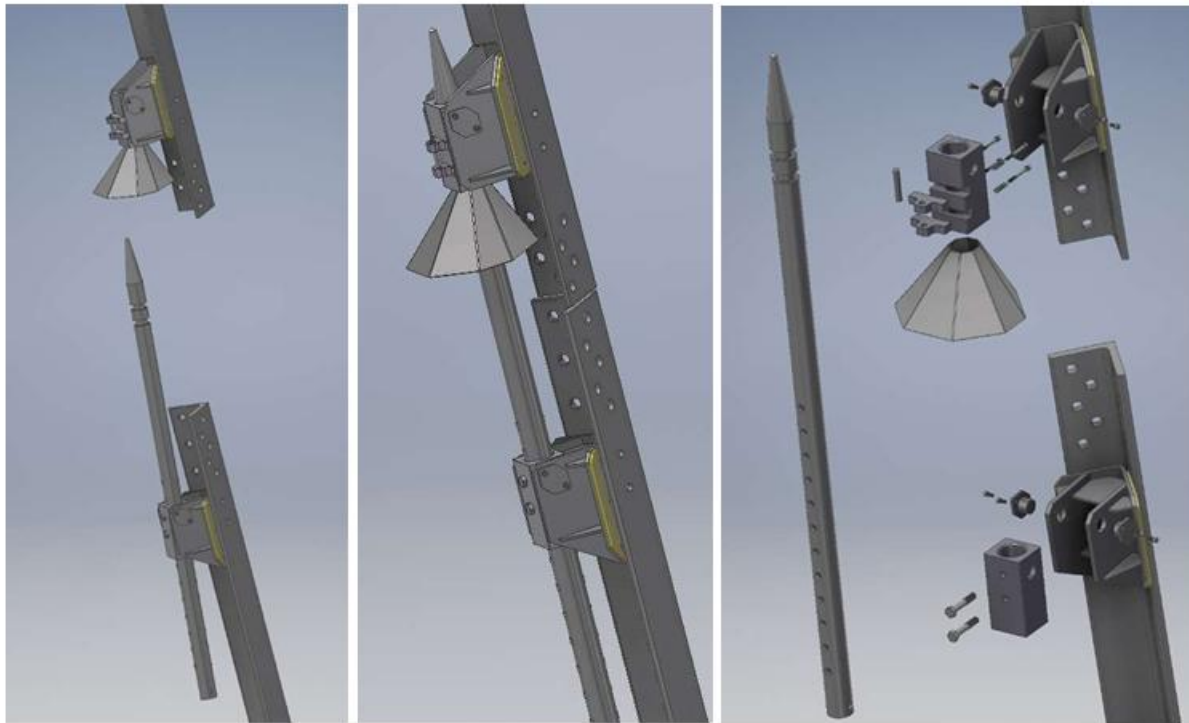


Figure 1 – Latch, Pike and Guide. Coupling action and exploded view of the components.

Design of self-locking system removes the need for workers to perform alignment tasks beneath multi-tonne assemblies

Still in concept-phase, idea is to work out to PoC.

Focus is much on efficiency and sustainability, but safety is also very important pillar in OHL design

B2_PS2_10229_BOSZE_2026

Evaluation, Analysis, and Recommendation of Acceptance Criteria to Determine Ageing on Composite Core Conductors Utilizing the Arrhenius Method



Figure 2. Representative air circulating oven used for temperature exposures.

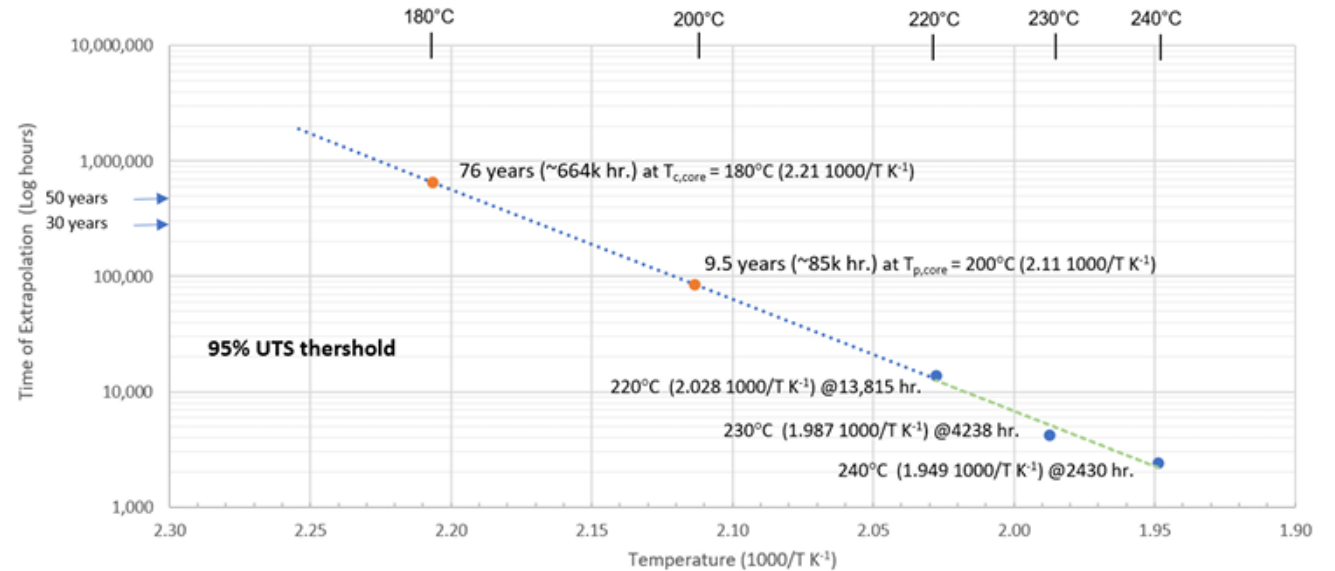


Figure 5. An Arrhenius plot shows the time at which CFC would reach a tensile strength value of 95% of its rated strength.

Lifetime expectancy CTC cores at different temperatures. Expected lifetime of >75 years at 180 degrees temp

B2_PS1_12444_ERSPAMER_2026

A new catenary system for safe and efficient crossing protection

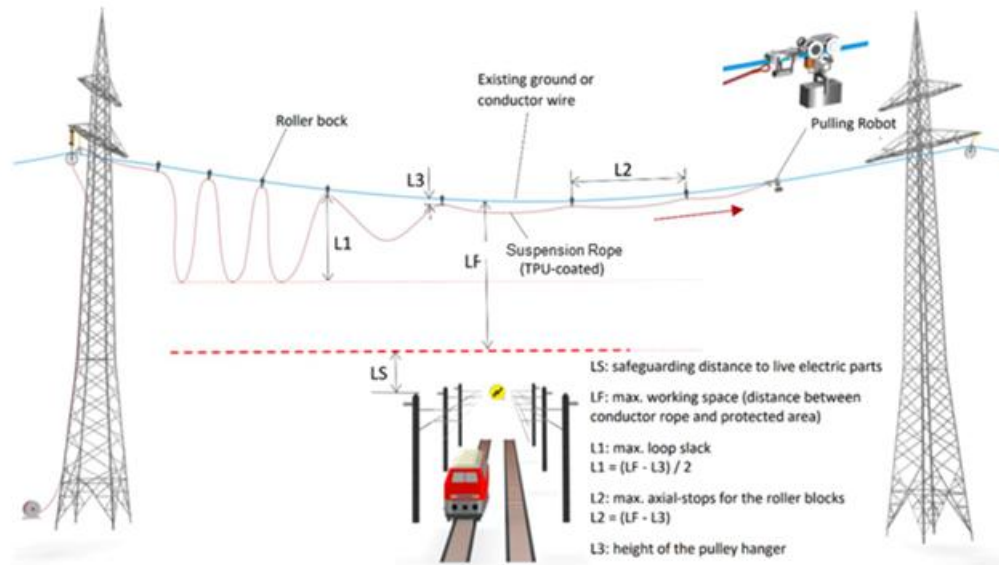


Figure 1 - Schematic illustration of the principal use of the catenary system



Figure 8 – Field Test “conductor break” for single conductor (left) and bundled conductor (right)

New improved catenary system (rollengordijn) more safer, quicker installation of conductors above critical infrastructure

B2_PS2_10290_TANNEMAAT_2026

Monitoring of overhead lines using the optical fibre in OPGW

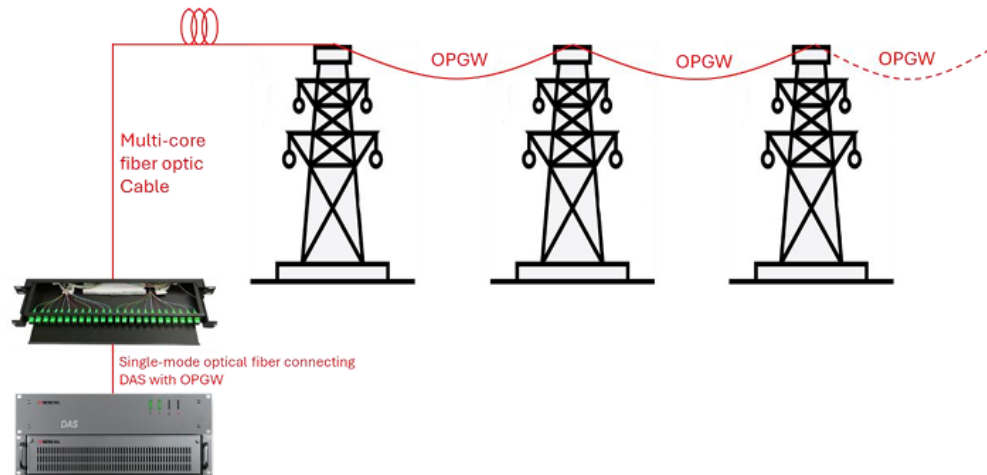
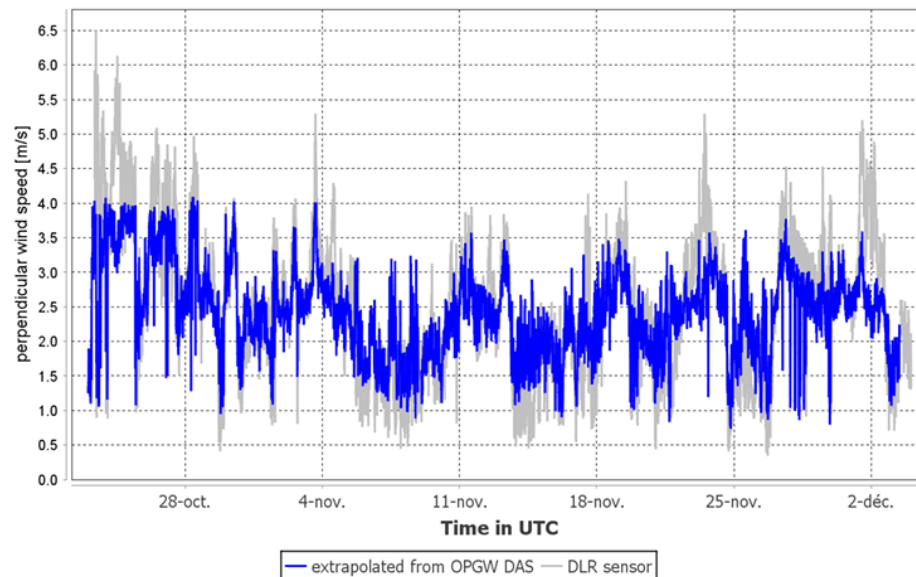


Figure 2 – DAS installation scheme, monitoring real time 68 km long overhead power line over OPGW.



- Distributed Acoustic Sensing (DAS) system on optical fiber in existing Optical Ground Wires (OPGW)
- Mechanical strain in DAS correlated to windspeed to phase conductor
- Checked with DLR sensor on phase conductor
- Good correlation, similar trends, with some underestimation

Can interesting application of using existing not-used fibers in OPGW conductors

B2_PS3_10291_BÖRGER_2026_

Changing Ice and Wet Snow Loads on Conductors of Overhead Lines (OHLs) in the Netherlands in relation to climate change



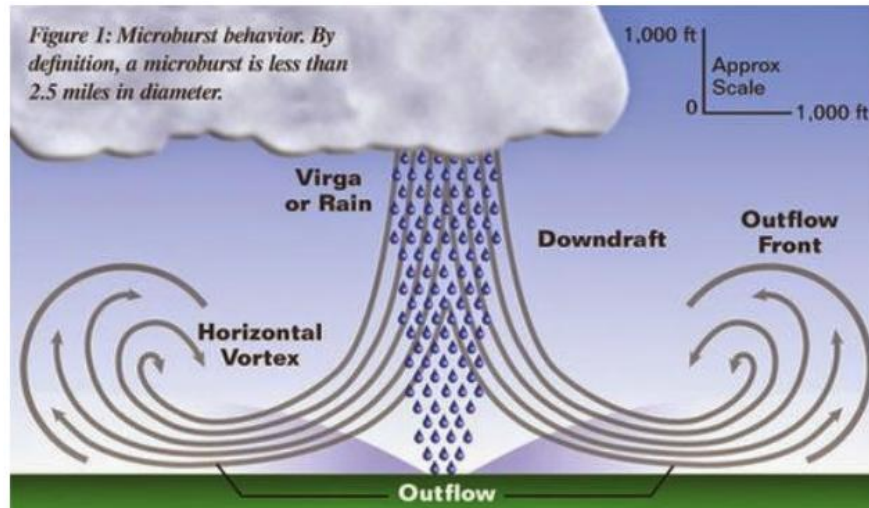
Based on extreme ice loads from '70 and '80s an more extreme ice loading condition (A) apply in North-East of the Netherland

Based on historical data from last 50 years the icing load is still more in region A but shall be lowered to $G_{i;rep} = 7 + 0.35 \times d$ N/m

New ice load in region A is roughly twice the load of region B (rest of the Netherland) in stead factor 3 (old ice value region A)

B2_PS3_10292_PLATENKAMP_2026

Study on impact downburst events on Overhead Lines (OHL) in the Netherlands in relation to climate change



Downburst events are the dominating cause of recent OHL failures in NL and surrounding countries

Climate model studies indicate 10-15% stronger gusts under +1.5 to +2°C warming

Extreme event return periods may change by factor 3-5

Existing 110/150 kV lines are most vulnerable

More research and international cooperation is needed and consider future HIW/downburst load cases

B2_PS3_12424_GÜNTHER-PAPADOPOULOU_2026

Sustainable lattice towers for 380kV transmission lines

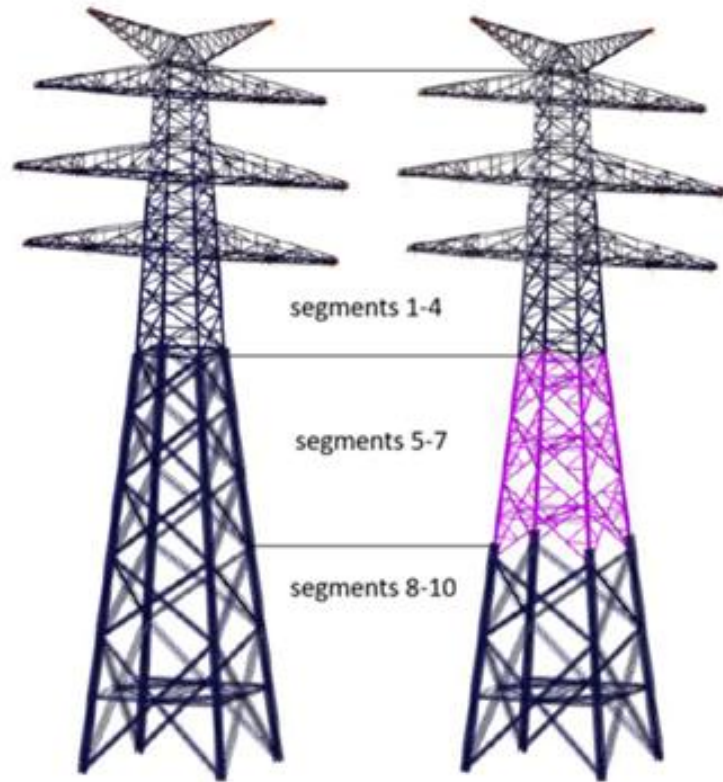


Figure 2 – System 1 (left) and system 2 (right)

S460 steel reduces tower weight by 8-17% and lowers CO2 footprint

Green steel reduces CO2 emissions by ~70%

Combination of S460 + green steel offers highest sustainability potential

OHL design with S460 steel needs normative adaptation

Production of S460 steel and green steel for OHL is developing but needs time and cooperation

Thanks for your attention!