CIGRE Study Committee B2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° B2.82	**Name of Convenor:** Lukasz NAZIMEK (PL) **E-mail address**: L.Nazimek@enprom.pl
Strategic Directions #[2]: 2,3	**Sustainable Development Goal #[3]: 7,11,13**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4] : 1,3,4,5,6	
Title of the Group: Overhead Line Foundations for Difficult Soil and Geological Conditions	

Scope, deliverables and proposed time schedule of the Group:

Background:

Routing new overhead lines (OHL) has become more and more a difficult task. The environmental and social constraints, as well as the increase of prices for getting a right-of-way can demand the planners to build overhead lines in extremely difficult terrain conditions such as mountains, flooded areas, landslides, swamps, etc.

Similarly, a lot of utilities are no longer able to build new lines and, as a result are reinforcing and uprating/ upgrading their existing lines. In such cases, structures and foundations need to be reviewed and strengthened, as necessary. Where older lines were built in difficult terrains, the design of foundation strengthening may be very difficult depending on access and/ or conditions of soil and geology on site.

History shows many examples of OHL failures caused by badly designed or improperly installed foundations. Some of them were destroyed by typically natural phenomena such as landslides, earthquakes, floods, storms, etc. Some others have failures related to changes in the environment made by humans.

It is possible to design overhead line foundations for extremely difficult soil conditions and access limitations, provided that the environmental impacts are correctly evaluated. Normally, such foundations require unique design and construction technologies, which are not prescribed by codes or standards.

Above arguments support the fact that design and constructions of foundations in difficult soil and geological conditions is still considered one of the most critical challenges for OHL designers, contractors and operators.

Scope:

The aim of this new Working Group is to provide guidance on foundation options, and how to select reliable and cost-effective solutions for designing, constructing and maintaining foundations in difficult soil conditions.
The main objectives of this Working Group are:

1. Identify foundation load combination for various structure types.
2. Identify and classify various difficult soil and geological conditions affecting design, constructions and operations of OHL's (including unstable soils, high water table conditions, ex-waste sites, abandoned mines, etc.)
3. Review various design methodologies used when selecting foundations for difficult soil conditions considering various security levels and cost considerations.

4. Review available design tools.
5. Review and available foundation research results on 1:1 scale tests
6. Review available construction technologies considering site access, property restrictions, terrain features, ground reinforcement, soil improvement, prevention against corrosion (metallic trussed foundations), weather conditions, installation cost, limited time for access, etc.
7. Identify foundation reinforcement methods used in remedial work and for upgrade projects, even considering replacing footing in some cases.
8. Carry out an industry survey to gather new materials/best practices for new designs as well as uprating / upgrading projects.
9. Collect challenging case histories from the industry and OHL owners.
10. Review benefits of various foundation designs from an operational and maintenance point of view.

References: B2 TBs, WGs, etc.

[1] WG 22.07, “Foundation testing”. Cigre, TB no 081, 1994.
[2] WG 22.07, “Refurbishment and upgrading of foundations”. Cigre, TB no 141, 1999.
[3] WG 22.14, “High voltage overhead lines. Environmental concerns, procedures, impacts and mitigations”. Cigre, TB no 147, 1999.
[4] WG 22.07, “The design of transmission line support foundations - an overview”. Cigre, TB no 206, 2002.
[5] WG B2.07, “Design and Installation of micropiles and ground anchors for OHL support foundations”. Cigre, TB no 281, 2005.
[6] WG B2.07, “Foundation Installation – An Overview”. Cigre, TB no 308, 2006.
[7] WG B2.13, “Guidelines for increased Utilization of existing Overhead Transmission Lines”. Cigre, TB no 353, 2008.
[8] WG B2.08, “Investigation on the Structural Interaction between Transmission Line Towers and Foundations”. Cigre, TB no 395, 2009.
[9] WG B2.29, “Overhead Line Design Guidelines for Mitigation of Severe Wind Storm Damage” TB 485, 2012.
[10] WG B2.22, “Mechanical Security of Overhead Lines Containing Cascading Failures and Mitigating Their Effects”. Cigre, TB no 515, 2012.
[11] WG B2.23, “Geotechnical aspects of overhead transmission line routing – an overview”. Cigre, TB no 516, 2012.
[12] WG B2.54, “Guidelines for the Management of Risk Associated with Severe Climatic Events and Climate Change on Overhead Lines”. Cigre, TB 598, 2014.
[13] WG B2.51, “Guide to Overall Line Design”. Cigre, TB no 638, 2015.
[14] WG B2.23, “Dynamic Loading Effects on Overhead Lines - Impact on Foundations” Cigre, TB no 788, 2020.
[15] WG B2.65, “Detection, Prevention and Repair of Sub-surface Corrosion in Overhead Line Supports, Anchors and Foundations”
[16] WG B2.81, “Increasing the Strength Capacity of Existing Overhead Transmission Line Structures”

Deliverables:

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

Time Schedule: start: Jan 2021	**Final Report**: Sept 2024
Approval by Technical Council Chairman: **Date**: October 21st, 2020	

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.