

**CIGRE Study Committee B2**

**PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP**

<b>WG 1<sup>o</sup> B2.83</b>	<b>Name of Convenor:</b> Oswaldo Regis (Brazil) E-mail address: <a href="mailto:oswaldo.regis@gmail.com">oswaldo.regis@gmail.com</a>
<b>Strategic Directions #<sup>2</sup>:</b> 2, 3	<b>Sustainable Development Goal #<sup>3</sup>:</b> 9, 11
<b>The WG applies to distribution networks:</b> <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	
<b>Potential Benefit of WG work #<sup>4</sup>:</b> 1, 2, 3, 4, 5	
<b>Title of the Group:</b> Mitigation of induced noises by corona activity in overhead AC and DC lines	
<b>Scope, deliverables and proposed time schedule of the WG:</b>	
<b>Background:</b>	
<p>In many countries, there is an important and growing concern with induced effects of electrical field stress in conductor surface and fittings producing corona activity in overhead lines. Among these effects are the “corona induced noises”: AN - Audible Noise and RI - Radio Interference.</p> <p>In recent years, several methods and technical efforts to mitigate induced effects of corona activity have been developed that can help in reducing this effect. Increasing conductor size, new conductor technologies, surface treatments, cleaning and application of coatings are some examples of these efforts.</p> <p>Under a theoretical and conceptual perspective, the geometry optimization of bundle configurations and phase arrangements have a great potential in reducing effects of corona activity and have not been implemented nor explored yet.</p> <p>Obviously, results can be more effective especially when the engineering action incorporates contributions from more than one of the efforts/approaches above mentioned.</p> <p>With respect to modelling of the phenomena, existing expressions for the prediction of induced noise levels were established by empirical correlations between values calculated of the electrical field stress in the conductor surface and the measured effect - the noises, detected at a determined distance. Such models have been adopted until now, despite of an almost general agreement about the need of revising them.</p>	
<b>Scope:</b>	
The purpose of this working group is to produce:	
<ul style="list-style-type: none"> <li>• A brief literature review of: <ul style="list-style-type: none"> <li>○ existing methods for corona activity prediction (AN and RI);</li> <li>○ processes, components, and variables affecting induced effects of corona (i.e. shape of conductors and fittings, different configurations, weather conditions, altitude, noise of rain superimposed on corona noise, background noise);</li> <li>○ evaluation of the different factors causing lines noises, as well as the compilation of available solutions for mitigation of this unwanted effect;</li> <li>○ current state of the art for modelling and determination of induced effects of corona activity levels: <ul style="list-style-type: none"> <li>- by simulating - review of excitation equations.</li> <li>- by measuring - review of existing standards.</li> <li>- by laboratory modelling – use of corona cage</li> </ul> </li> </ul> </li> </ul>	

- possible methods to reduce induced effects of corona activity including evaluation of effectiveness of each method (conductor surface treatments, conductor cleaning and coatings; conductor outer layer wire shape; conductor surface treatments - blasting, artificial aging; hollow conductors or hollow wires; bundle re-arrangements, reconductoring in existing lines; voltage adaption; phase arrangements and conductor bundle configuration, and its effects on the fittings electric field stresses and noises)
- a review on what has been done about bundle optimization (including non-conventional bundle and phase configuration);
- Survey of acceptable limits, different national and international regulations and practices, including calculation methods. Limits inside the right of way, on the edge of the right of way. Considerations for urban, rural and uninhabited areas.
- An analysis on the cross-interaction effects among methods to reduce induced effects of corona activity (e.g. increase of EMF when increasing internal clearances).

Actions of the WG are planned in two steps, which will be carried out with some activities together and producing results in a timeline sequence.

- **1<sup>st</sup> step** (from November 2020 to November 2022) **CSE paper**

As the first step, the central aim of the Working Group is to address in detail the mitigation of induced effects of corona activity by optimizing bundle geometry configuration and phase arrangements, dealing with both new and existing overhead lines.

It is important to point out that above mentioned methods and actions to reduce induced effects of corona activity, can cooperate and be adopted in going together to reach the aim (reduction of noises).

However, in sake of being efficient within time schedule, the intention of this WG is to go deeper in other methods after having:

- the compilation of a survey;
- the engagement of experimental facilities and
- after obtaining and compiling already available results of experimental data.

An article for CIGRE Science and Engineering CSE will be produced as deliverable in this **first step**.

- **2<sup>nd</sup> step** (from November 2022 to November 2024) **Technical Brochure**

This second stage incorporates the developments of the previous step and, as early as rational, the activities will be carried out in parallel with the first stage.

After having the survey and its compilation, as well as going to studies (analytical and/or experimental) to review usual modelling to quantify induced noises, the Working Group will be able to produce a Technical Brochure as a **second step** (second target), incorporating the discussions and evaluation on other methods and actions (surface treatments, cleaning and coatings; outer layer wire shape; blasting; artificial aging; hollow conductors or hollow wires; hardware and fitting noise evaluation). An important and central objective of this second stage is to review empirical expressions (modelling) which were derived to quantify the 'noises'. It is important to point out that reviewing usual modelling to quantify induced noises demands experimental work by laboratory modelling – use of corona cage - and, consequently, it is a time-consuming stage.

**Reference to other Technical Brochures and WGs relevant for this WG**

The subject of this proposal has been partially addressed by previous CIGRE Technical Brochures. For example:

- TB 583 “Conversion of existing AC lines to DC operation”
- TB 748 “Environmental issues of high voltage transmission lines in urban and rural areas”
- TB 638 “Guide to overall line design”
- TB 631 “Coatings for Protecting Overhead Power Network Equipment in Winter Conditions”
- TB 616 “Externalities of Overhead High Voltage Power Lines”
- TB 763 Conductors for the uprating of existing Overhead Lines?
- TB 792 “Compact AC Overhead Lines”
- It is also being partially addressed by current Working Groups:
  - B2.40 “Review of electrical and mechanical loading combinations of Overhead Lines for maximum ground / obstacle and Right-of-Way impact considerations “,
  - B2.62 “Design of compact HVDC overhead lines”,
  - B2.69 “Coatings for Power Network Equipment”.

**Deliverables:**

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

**Time Schedule:** start in November 2020

**Final Report:** November 2024

**Schedule for Publications:**

CSE - CIGRE Science and Engineering: November 2022;

Technical Brochure, Executive Summary in Electra and Electra Report: November 2024

**Approval by Technical Council Chairman:**

**Date:** November 16<sup>th</sup>, 2020



Notes: <sup>1</sup> Working Group (WG) or Joint WG (JWG), <sup>2</sup> See attached Table 1, <sup>3</sup> See attached Table 2 and CIGRE reference Paper: Sustainability – at the heart of CIGRE's work. <sup>4</sup> 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	<b>SDG 7: Affordable and clean energy</b> 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	<b>SDG 9: Industry, innovation and infrastructure</b> Facilitate sustainable infrastructure development; facilitate technological and technical support
11	<b>SDG 11: Sustainable cities and communities</b> 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	<b>SDG 12: Responsible consumption and production</b> 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	<b>SDG 13: Climate action</b> E.g. Increase share of renewable or other CO <sub>2</sub> -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	<b>SDG 14: Life below water</b> E.g. Effects of offshore windfarms; effects of submarine cables on sea-life
15	<b>SDG 15: Life on land</b> E.g. Attention for vegetation management; bird collisions; integration of substations and lines into the landscape

**Table 3: Potential benefit of work**

<b>1</b>	Commercial, business, social and economic benefits for industry or the community can be identified as a direct result of this work
<b>2</b>	Existing or future high interest in the work from a wide range of stakeholders
<b>3</b>	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
<b>4</b>	State-of-the-art or innovative solutions or new technical directions
<b>5</b>	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
<b>6</b>	Work likely to contribute to improved safety.