DISCUSSION MEETING SUMMARY

Study Committee B2

(Overhead lines)

Friday August 30th, 2024

Chair: **Pierre Van Dyke**

Secretary: **Vivek Chari**

Special Reporters: PS1 Jean-François Goffinet (PS1), Jan Maesschalck (PS1), Sharon Mushabe (PS2), John McCormack (PS3) and Asif Bhangor (PS3)

1. INTRODUCTION

The 2024 Group Discussion Meeting of Study Committee B2 was held on August 31 in the Grand Amphitheatre at the Palais des Congrès in Paris from 8h45 am until 6h00 pm.

To foster the dissemination and advancement of new knowledge, SC B2 has chosen the following three preferential subjects for the 2024 Paris Symposium.

- **PS1 Challenges from renewables integration and influences of energy transition on OHL**
  - Technical solutions for increasing power transfer capabilities of existing OHLs, methods for enhancing line/corridor utilization.
  - Methods and strategies to accelerate approval and permit processes, stakeholder engagement.
  - Innovative solutions and construction techniques for overhead lines.
- **PS2 Asset management, strategies, technologies and methods for OHL**
  - Safeguarding of existing OHL from impacts of external infrastructure, encroachments, vandalism, sabotage.
  - Asset health index (AHI), time-based and risk-based inspections, ageing, residual life assessments, protective treatment of components.
  - Innovative maintenance methods, use of artificial intelligence (AI), augmented and virtual reality techniques (AR-VR) and increasing resilience.
- **PS3 Impacts from climate change on OHL**
  - Impact on OHL design and operations due to climate change.
  - Lessons learned for TSO/DSO, studies and practical experiences from a changing environment.

2. RUNNING OF THE MEETING

The Group Discussion Meeting was chaired by the Study Committee Chair, Pierre Van Dyke, with the Special Reporters Jan Maesschalck (PS1), Sharon Mushabe (PS2), and Asif Bhangor (PS3) and Vivek Chari as SC B2 Secretary.

John McCormack could not attend the GDM meeting and Jean-François Goffinet had to miss it because of COVID but fortunately, he is recovering well.

3. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 1

The authors of the 35 contributions presented in PS1 are to be commended for their valuable input in advancing knowledge in the technical field of OHL. Similarly, the authors of the 46 questions and spontaneous contributions for PS1 have further enlightened the various topics discussed in the CIGRE papers. Although we would have liked to discuss contributions, time constraints prevented us from doing so.

Contributors recommended installing sensors for Dynamic Line Rating (DLR) at every crossing and major change in the line's direction. Other suggested approaches were to select spans frequently within 5% of the ampacity limit and conduct a cost versus risk analysis. Additionally, performing Lidar measurements to assess the line's actual condition was advised. To mitigate risk, one contributor proposed adjusting calculations by reducing wind speed by 0.5 m/s and increasing ambient temperature by 2°C. The possibility of removing the sensors once a reliable relationship between weather forecasts and conductor sag has been established was also discussed.

It was widely agreed that estimating and predicting wind velocity from weather data is more challenging than ambient temperature.

The sensors typically have a lifespan of around 10 years, with maintenance required after 5 to 10 years, depending on the manufacturer.

In case of a malfunction in the DLR system, it automatically switches back to the seasonal rating approach.

There was also a discussion on smart conductors equipped with fibre optics, which can measure their temperature along the line and detect vibrations, line breaks and hot spots from broken strands. It appears that the life span of the fibre optic matches that of the conductor.

Surface treatments for acoustic noise reduction were also discussed but it seems to be an ambiguous solution. Both Z-shaped and circular wire conductors generate similar noise levels under the same conditions.

Retrofit insulated crossarms were also presented as a method to increase the voltage level of a line.

4. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 2

Sixteen questions for PS2 were proposed in the special report, and 23 prepared contributions were received. It led to an engaging session at the general discussion meeting on the topic of Asset Management, Strategies, Technologies and Methods of Overhead lines. We kicked off with spontaneous contributions covering the determination of the residual life of insulators. It was evident from the number of contributions we received covering the subject, that the management of insulators currently in operation remains a key issue for utilities around the world. One contributor mentioned that any type of insulators should last 40 years if they are well manufactured.

There were two contributions on the tower and foundation designs, including a corrosion repair method for steel pipes using carbon fibre reinforced plastic.

Delegates and contributors in attendance also shared how they have managed to leverage new technologies on their paths to digitization by including the use of satellite technologies, sensor technologies, artificial intelligence and machine learning to manage their overhead transmission line assets. Six contributions described their experiences using UAVs for inspections and three on the use of nano satellites for the maintenance of the right of way.

Lastly, one contribution was on electrical worker safety. It was a lively discussion with prepared and spontaneous contributions from over 11 countries.

5. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 3

The contributions of PS3 focused on the impacts of climate change on overhead line (OHL) networks, specifically evaluating current and proposed industry practices aimed at mitigating operational performance issues and minimizing risk.

The contributions provided a comprehensive overview of the prediction and monitoring of OHL impacts resulting from weather events. This included an assessment of historical data related to fires, landslides, floods, lightning, hill subsidence, and wind. Contributors detailed the mitigation measures adopted by each Transmission System Operator (TSO) to address operational service losses due to these risks.

Key changes implemented by each TSO, tailored to their specific regional climatic exposures, were highlighted. For instance, an Australian example illustrated the regulator's mandate to increase standard design wind speeds following failures in 2020. Similarly, a Japanese example discussed the reinforcement of tower bracing design standards to account for snow loading.

Regarding OHL operational performance, contributors from India highlighted the benefits of a nationwide program for line surge arrestors, which has reduced the frequency of trips caused by lightning strikes. Additionally, Brazilian experiences were shared, emphasizing the need to consider dynamic line rating in digital twin models during hotter, windless days for reliable line rating predictions, as static line rating is deemed unsafe under such conditions.

6. NGN PAPERS

We also had four interesting NGN papers presented, each covering different aspects of overhead line technologies such as:

- Dynamic line rating
- Composite conductors
- Conductor vibration
- Audible noise

The papers were very well presented, raised interest and one of the questions was if more detailed results had been published, which is the case.

7. SC B2 Technical Award

This year, the Technical Award was attributed by the SC B2 chair, Pierre Van Dyke, to Kjell Halsan from Norway for his impressive technical contributions over more than 25 years in CIGRE by organizing Working Group meetings in Norway, being SC B2 National representative of Norway, special reporter in Paris, Convenor of WG B2.47, and the current convenor of SC B2 Customer Advisory Group (CAG). He also encouraged and supported colleagues to participate in CIGRE and he is well respected for his open, friendly and professional manner. This is a well-deserved award and there was a big round of applause for his nomination.

8. CONCLUSION

Entrance to each event were recorded during the symposium and the SC B2 Group Discussion Meeting was the most attended one with 1061 entrances during the day. This great participation led to lively technical exchanges during the whole day.

This year, a total of 96 papers has been accepted which is an increase of 40% compared to 2022.

The Special reporters prepared a total of 57 questions addressed to CIGRE experts and 67 prepared contributions were accepted. The prepared contributions came from 23 different countries, 17% from Brazil and 15% from Japan. In some cases, we had multiple contributions from the same delegates.

Moreover, there were over 70 questions or spontaneous contributions during the session which led to very interesting discussions. There was a good variety of topics covered, and the most discussed ones were:

- Dynamic line rating including number of sensors and wind predictions
- Smart conductors for monitoring
- Acoustic noise
- Insulator crossarms
- Inspection of composite insulators
- Drone inspection
- Artificial Intelligence
- Adaptation to climate change

The chair thanked the Special Reporters for all the work they did in preparation for the GDM and for managing so well the event especially given the last-minute replacements. He also thanked the SC B2 secretary for his great support throughout the whole event.