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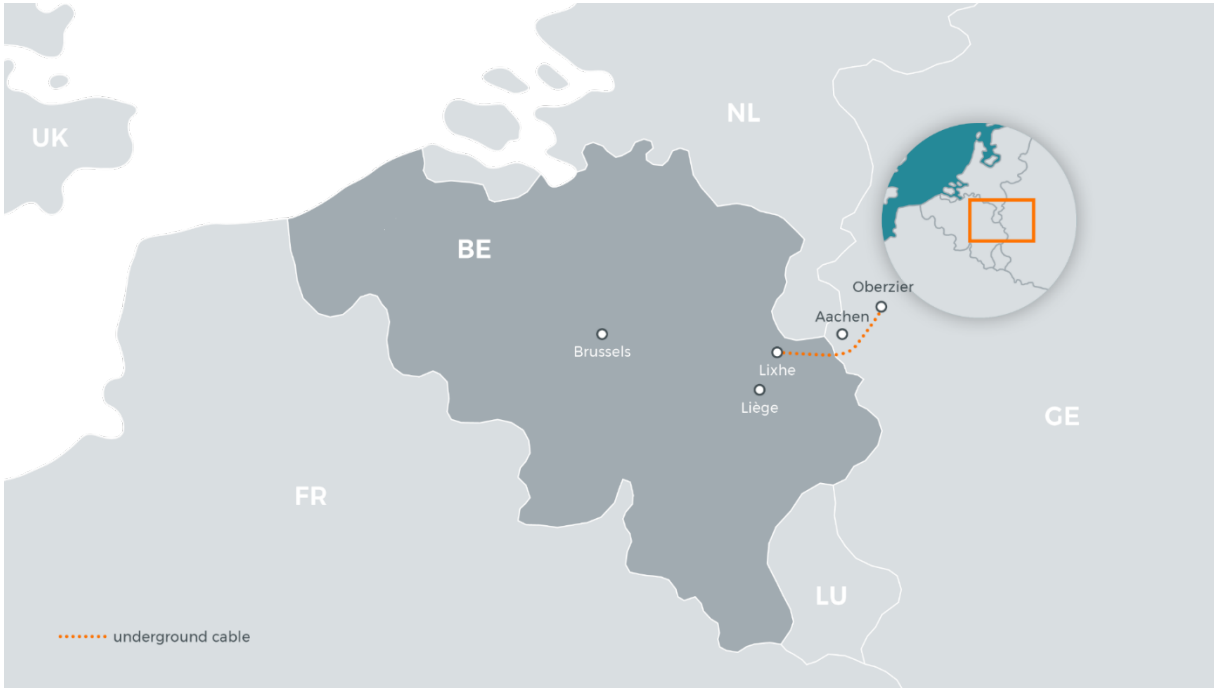
GROUP REF. : B1
PREF. SUBJECT : PS1
QUESTION N° : Q1

**PD measurement during commissioning test of a 320kV HVDC link**

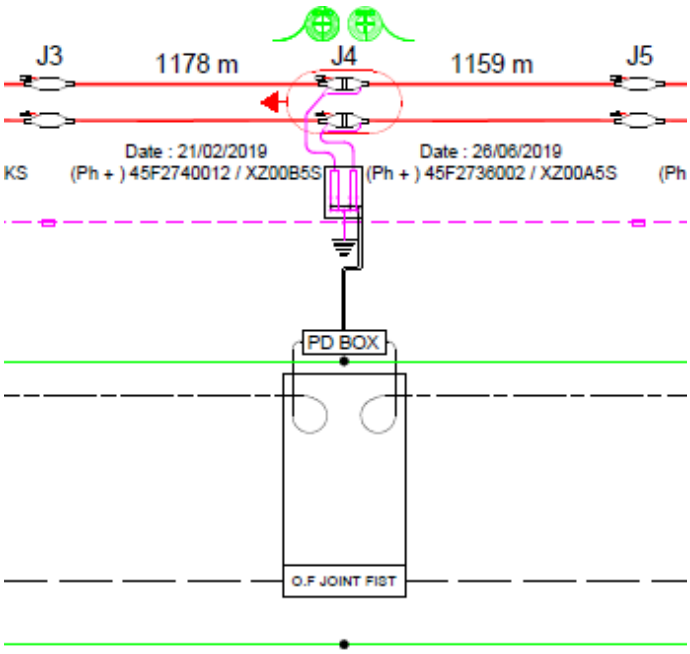
ALEGrO, the first interconnector between Belgium and Germany is in operation since end 2020.
The interconnector is capable of transmitting 1000MW net power in both directions and has an operational voltage of 320kV HVDC. The cable route length is roughly 90km long and the cable used is a 2500mm² copper cable with XLPE insulation.




Since the ALEGrO interconnector is fully land based, a relative high number of joints are foreseen in the project. To reduce the risk with relation to the installed joints on site, additional testing of the HVDC cable link was requested, comparable to what is done for land HVAC cable systems.
For these HVAC cable systems, the use of HV testing at raised voltage in combination with PD measurements have proven their added value in order to detect possible material and assembly failures in the cable system, especially for the accessories installed.

Since no or very limited experience with PD measurements under DC voltage, the decision was taken to perform a HVAC test with PD measurements on the HVDC cable system during commissioning.
This decision affected the standard FAT test on HVDC cables. No HVDC test was performed during the FAT.

In order to facilitate these PD measurements during the commissioning of the cable link, some basic infrastructures are foreseen for the PD measurement. These consist of PD sensors, fibre optic cable for communication, boxes that collects the FO cables, the sensor cables and capable to install the temporary active equipment and batteries needed during the PD measurement.




The decision was also taken to perform intermediate HVAC test with PD measurements on smaller sections of the cable link (2 intermediate tests at BE side and one at GE side). This being part as a mitigation action to reduce the risk of a failure during final the testing of the complete link, which could have an important impact on the project end date.

The active equipment and batteries were installed temporarily in the boxes foreseen, in order to perform PD measurements during dielectric testing during the commissioning phase.

For the final commissioning test, due to the total length of the cable system (90km), separate tests were foreseen for the Belgian and the German part. This to limit the number of test trucks and the space required for these tests.

Although the basic (passive) infrastructure for online PD measurement is foreseen on the ALEGrO cable link, the HVDC cable system is not equipped with a permanent online PD measurement system.

Online PD measurements are applied on some HVAC cable systems; however, the benefit is still under evaluation.

For long HVDC cable links the remaining challenges concerning online PD measurements remains the following:

- Experiences with PD measurements under DC voltage
- Infrastructure for online PD measurements such as power supply of the active equipment along the cable route

Furthermore, HVDC cable systems are often (partially) offshore cables. For these offshore applications, no industrial solutions exist to perform PD measurements on long lengths.