

Assessment of overheating in XLPE MV cable joints by partial discharge measurements

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There are 140.000 km of cables in the Norwegian distribution grid, with more than 40% installed during the 1980s and 1990s. A significant number of these cables have reached their expected lifetime of 30 years. Further, there are likely more than 100.000 splices installed in the Norwegian distribution grid. One major challenge related to service reliability of these cable links, is overheating in XLPE joints. The overheating is caused by bad metallic connections in the joint. Such connections are located to e.g. the metallic conductors and joint ferrule, the ground screens of the cable and joint or the cable ground screens and the outer aluminum water tight laminate.

In this work partial discharge (PD) measurements have been performed on service aged 24kV XLPE joints. The joints have been removed from service after only some years due to joint failures in the same cable link. The statistical distribution of the PD activity was measured at voltages up to 12kV at very low frequency (VLF, 0.1 Hz) and at power frequency (50 Hz). This was done in order to examine if PD occurred at service stress and the possibility to detect the discharges by using a VLF diagnostic test method.

The results show that the PD inception voltage (PDIV) was decreased for an increasing test voltage frequency. At 0.1 Hz the PDIV was found to be above service voltage, whereas it was below service voltage for 50 Hz. This implicates that PD activity is likely present at service voltage, but this is not assessed by the PD measurements at VLF. Dissection of the joints reveals that a high contact resistance between the ground screens of the cable and joint has caused overheating with subsequent damage to the insulation system in the joint during service.