Risk on failure, based on PD measurements in actual MV PILC and XLPE power cables

Yizhou **QIAN** (1), Paul **WAGENAARS** (2), Fred **STEENNIS** (3), Denny **HARMSEN** (4), Piet **SOEPBOER** (5), Pascal **BLEEKER** (6)

1 Technical University Eindhoven, Eindhoven, the Netherlands, q5022679@163.com
2 DNV GL, Arnhem, the Netherlands, paul.wagenaars@dnvgl.com
3 DNV GL, Arnhem, the Netherlands, fred.steennis@dnvgl.com
4 Alliander, Arnhem, the Netherlands, denny.harmsen@alliander.com
5 Enexis, Arnhem, the Netherlands, piet.soepboer@enexis.nl
6 Locamation, Enschede, the Netherlands, pascal.bleeker@locamation.nl

Many papers discuss partial discharge (PD) activity as measured

- during an off-line test in actual MV power cables or
- over time, as measured during laboratory circumstances.

Seldomly, actual PD development is measured as a function of time under service circumstances, and certainly not (often) under service conditions until an actual failure happens. For the first time this critical and crucial information is now made available on a large scale, following measurements done with Smart Cable Guard (SCG).

The information on PD development is crucial, since network owners have to know whether a certain PD generating component needs to be replaced or not, in case of measured PD activity.

This paper will show the average duration between the start of PD activity and the moment of a failure based on actual measurements. It will be shown that in case of MV XLPE insulated cable systems (cable, joints or terminations), the time until failure is weeks or months (depending on the PD activity level measured), where this is for MV PILC cable systems many years.

This information shows why in XLPE cable systems a quick replacement of a PD generating defect is worth to consider, where in case of PILC cable systems, quick replacement is seldomly needed.

As an appetizer, Fig 1 shows the Weibull plot showing the failure probability (y-axis) as a function of time (x-axis) in case all data for XLPE and PILC cables is mixed. It shows that there is a 50% change on failure after 3 years (with 90% confidence bounds it is 1 to 8 years).

This time-to-failure information will help network owners to decide whether a certain PD generating defect should be replaced soon, later or not at all.

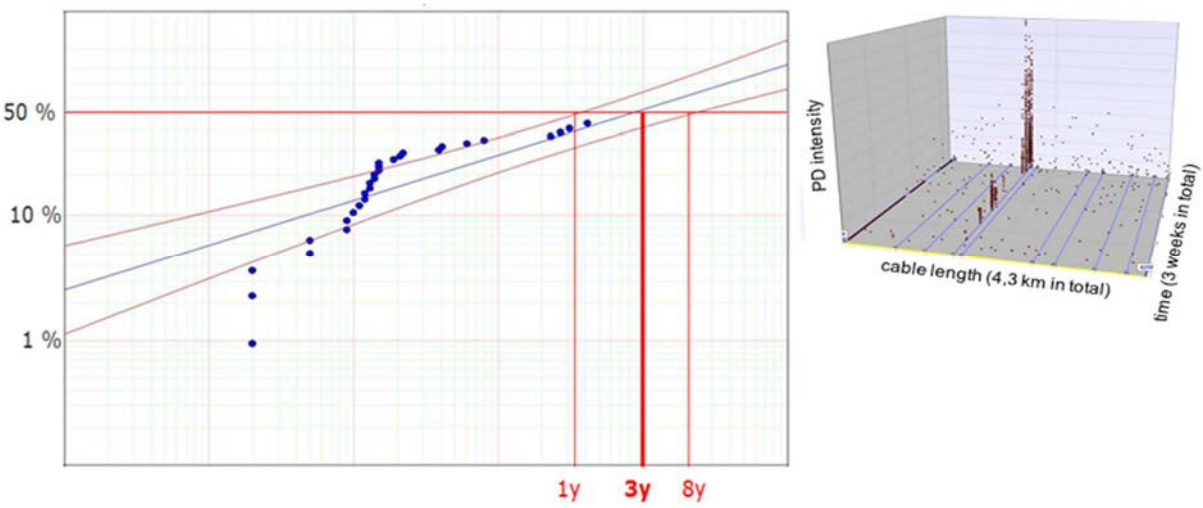

Fig 1: Left, the failure probability as a function of time in case the cable system is not identified; right the actual PD development plot until failure for one the cases (blue dots in the left graph).