

A retrospective analysis of XLPE Cables tested in the Field Sub F Spring ICC 2025



N. Hampton J. Perkel

May 2025

in X f www.epri.com © 2025 Electric Power Research Institute, Inc. All rights reserved.

Background

- Late in the last century, EPRI undertook a major study (Rpt: 1001892) of Health Assessment approaches.
- As part of the work measurements of XLPE cables at ten different utilities, these cables were then extracted and characterized by laboratory testing.
- It was decided that it would be valuable to reexamine these data to avail ourselves of new methods, perspectives, or objectives that weren't considered during the original reporting.





Laboratory Conditioning and Testing





HVTT	23	33	23	HVTT	23	33	33	33	HVTT	23	33

HVTT = Breakdown ACLT 23 = 2Uo, 75C ACLT33 = 3Uo, 75C

Responses

Initial Breakdown

Subsequent ageing failures Final Breakdown

Water Treeing

Example Field Tan Delta Measurements





Aggregated VLF TD Features



Hypothesis



Hypothesis Test Data



Dielectric Properties as







In Conclusion

- 1. It is valuable to revisit previous experimental work as it can give new insights into current issues
- 2. Increased dielectric properties correlate with
 - increasing occurrence of water trees
 - with decreased breakdown strength
- 3. Do not see a correlation between OWTS (DAC) estimates of dielectric properties and VLF TD estimates even when the range of loss properties is large

Analysis of the times to failure under accelerated conditions will commence soon

Nigel Hampton has more than 35 years of experience in the MV, HV & EHV cable field at BICC in the United Kingdom, Borealis in Sweden, NEETRAC, UL Solutions and currently EPRI in the United States. He has been active in the international community of CIGRE participating in WG's on Space Charge, Water Tree Diagnostics, HVDC Testing and most recently as the US representative on the Reliability Analysis Group for HV & EHV. Nigel currently Chairs IEEE400.0 Field Testing Techniques and IEEE400.2 Field Testing using VLF Sources. Nigel has served as the Technical Advisor to the AEIC Cable Engineering Committee since 2008.

His current research interests include: Extruded MVDC, VLF Diagnostics, Cable System Ageing, Forensics, HV & EHV Cable Systems.