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Irish overview of Partial Discharge (PD) testing applications and subsequent lessons learned

SC B1 Insulated Cables - PS1-Q1

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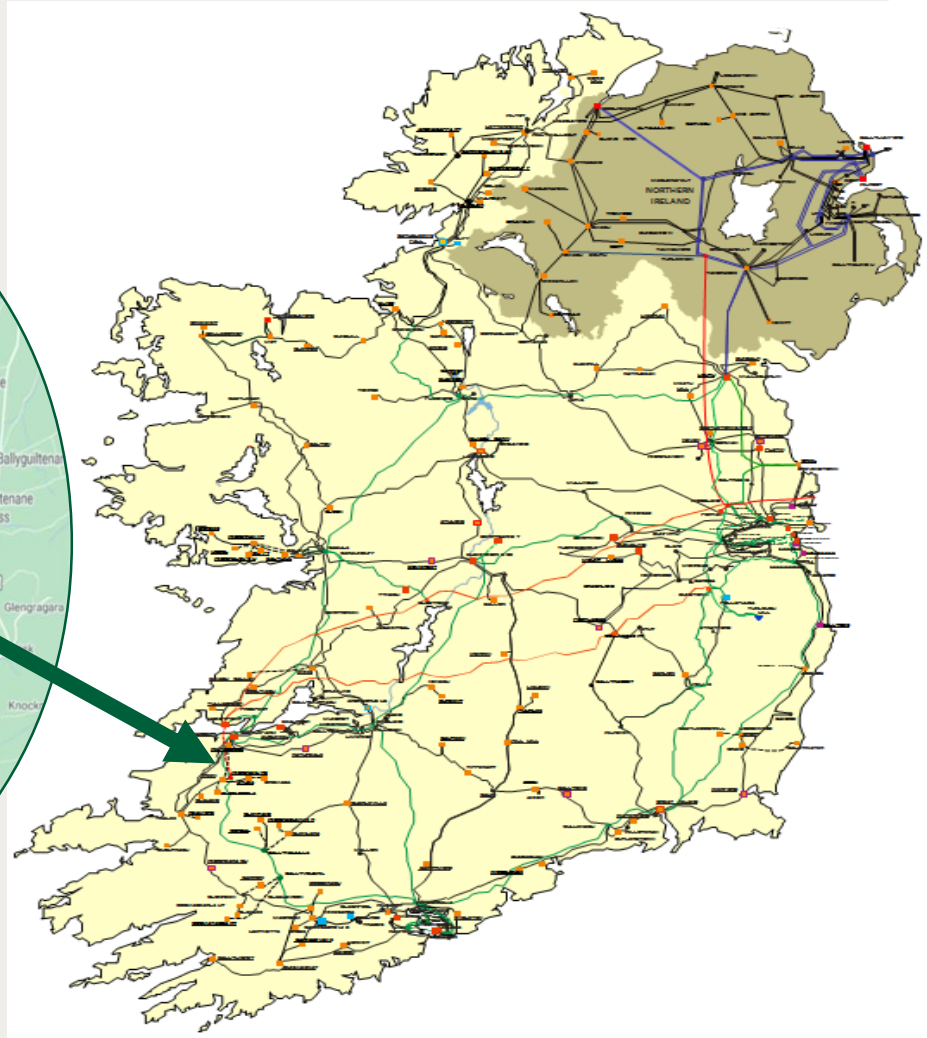
Overview of PD Testing

- What is PD Testing ?
  - *PD (Partial Discharge) Testing is a method of assessing the health of a cables insulation by identifying weak spots.*
  - *This method can be adopted at any stage of a cables life (Offline or Online).*

An Irish Perspective on PD Testing

- Kilpaddoge-Knockanure 220kV cable project in the south west of Ireland.
- The cable is approximately 22 km long and consists of 36 joint bays with a rating specified at 660 MVA.
- PD Testing completed using a Joint-Hopping technique.
- This test was completed at cable installation with a possible long term adoption.



How the PD Test was completed ?

- Position the 3 RTS (Resonate Test Set) as shown opposite at Joint Bay 1 (JB1) each rated at 260 kV and 83 A.
- Connect the circuit under test (One phase at a time).
- Connect and operate the PD monitoring system.
- Energise the circuit using a ramping process for the required test voltage and monitor the PD sensors.

PD Test Procedure

- The PD Testing required a voltage ramping process to verify and monitor the stability of the test voltage and current to eliminate the risk of faulty test set-up.
- *Ramping voltage is applied from 64 kV to 216 kV.*
- *Once the circuit is energised to the required operational voltage,* PD is to be monitored at each location (joint bay) once.
- A crew of 6 mobile test engineers collected PD data for up to 5 minutes at each joint bay. This technique used is an example of Joint Hopping/ Leapfrogging.

Challenges & Learnings

Challenges

- The length of cable (22 km) provided several challenges such as crew resources , logistics of equipment being installed, access to public roads etc.
- Due to the GIS switchgear at the remote ends of the circuit, offline testing had to be limited to JB1 to JB36.
- GIS Switchgear makes it very difficult to make a direct connection onto the cable being tested (issue with the VT warranty).

Learnings

- Successful PD Testing procedure completed with no issues identified.
- Joint Hopping technique is an effective method of collecting PD data.
- Several Benefits of Online PD testing with no requirement of outages etc.
- Potential utilisation of Cable Fibre Communication as a means of obtain/measuring PD Data from PD sensors.

Future Steps with PD Testing in Ireland

- Challenges with upcoming cable projects such as a 400 kV 50 km cable route.
- *Several issues with using PD Testing as a long-term monitoring strategy such as identifying alarm thresholds for PD alerts during cable operation*
- Recurring online PD testing has been identified as an effective long term monitoring strategy in Ireland.
- *HVDC PD testing applications to become more frequent with more offshore and interconnection projects coming online.*
- *The Irish TSO is considering the installation of PD sensing equipment at every JB to monitor PD activity on these location more effectively.*