



Polaris Diagnostics & Engineering Ltd has been commissioned by Scottish Hydro Electric Transmission (SHE Transmission), to carry out a Level 1 condition assessment of Culligran GT1 132/11kV Transformer.

The level 1 condition assessment has been carried out, based on a review and independent assessment of the historic oil data and SSEN Report T2BP-ACR-0024, both supplied by SHE Transmission.

Based on the assessment of the historical & current asset condition data, GT1 is in a condition commensurate with age and the transformer condition will continue to deteriorate, by ageing, during the RIIO T2 period. There is an increased risk of failure of the asset within this period due to contamination of the main tank oil. Further intervention will be required within the RIIO-T2 period to mitigate this increased risk of failure.

There is evidence that the transformer has externally deteriorated and requires immediate action, as defined by the iSIM system. Additional inspection and evaluation is required. The transformer is wet, as evidenced by a very erratic main tank moisture levels and despite the oil being reconditioned and regenerated, the moisture levels return to what is considered high levels. This suggests that there is either moisture ingress into the main tank, or the active part insulation is wet. Oil processing of the main tank oil has had a dilution effect on the measured 2FAL concentrations and as this is used to predict the condition of the paper insulation and “estimated residual life remaining” of that insulation, the estimate of 43% life remaining is considered optimistic.

This transformer is internally in “reasonable condition” but has a potential underlying thermal abnormality, which could manifest into a more serious deterioration. The transformer is wet and has a history of oil leakage. The main tank oil will require monitoring in the form of increased oil surveillance and may require enhanced maintenance within this period to prevent deterioration that may lead to failure. A ‘mid-life’ refurbishment should be considered in order to return the asset to a condition such that it will extend the asset life.

In order to mitigate the risk of an increased likelihood of failure during the RIIO T2 period and to understand the scope of work for a “mid-life” refurbishment, the following recommendations are made:

- Frequency of oil sampling should be increased to monitor both dissolved ethylene and moisture content and dielectric breakdown voltage. This should be done every 6 months with additional oil analysis (over and above routine measurements).
- Detailed inspection of the asset – outage required.
- Inspection and assessment of the moisture management system.

- 132kV bushings should be oil sampled for DGA and moisture analysis and assessed by the criteria set out in National Grid TGN 82. In addition the bushing power factor and capacitance should be measured. This would require an outage and the removal of the 132kV and 11kV bushings to facilitate the testing.
- Detailed condition assessment of the transformer to include Sweep Frequency Response Analysis (SFRA), Dielectric Frequency Response (DFR), 10kV Power Factor, 5kV Insulation Resistance and DC Winding Resistance testing. This would require an outage and the removal of the 132kV and 11kV bushings to facilitate the testing.
- Following detailed inspection continue with routine inspection.
- Continue with routine maintenance.
- Detailed load flow monitoring.

Author	Issue Authority
<p>Ian B B Hunter</p> <p>Technical Director</p>	<p>Ian B B Hunter</p> <p>Technical Director</p>
	