TESL CASE STUDY

TWIN OAKS GAS STOR EARTHING DESIGN

THE PROJECT

Twin Oaks short term operating reserve (STOR) is a new gas powered, 5MW generation project located at Twin Oaks farm, Lower Street, Doveridge, DE6 5JW. The Twin Oaks STOR is connected into the Western Power Distribution (WPD) 33kV distribution network via a teed underground cable to an overhead line Point of Connection (POC).

TESL INVOLVEMENT

We were contracted to undertake the earthing system design for the whole Twin Oaks Gas STOR.

PROJECT DATES

Project Start Date: Jul 2017
Submission Date: Sep 2017

CLIENT

Ethical Power Ltd

On-site soil resistivity test route

PROJECT OUTCOMES

One of the main functions of an earthing system is to ensure personnel safety during earth fault situations.

When an earth fault occurs, the earth return fault current, in conjunction with the resistance to earth of the earthing system results in an Earth Potential Rise (EPR) at the site. This EPR reflects the voltage rise on the earthing system where hazardous touch, reach-touch and step voltages can arise due to the voltage differences between the items of plant and the surrounding soil. It is essential that each item of plant is sufficiently earthed and the below ground conductors are effectively arranged so that safety to personnel is ensured.

The project involved designing the earthing system for both the contestable (DNO Metering Substation) and private installations. The diesel generators are located outside where the HV cabling is installed in protective cable trays.

Additional earthing in the form of both stranded conductor and rods were installed in the incoming HV cable trench to help redtesl the site resistance and the overall site EPR.

Once constructed TESL measured the site resistance by means of a Fall of Potential (FOP) test to compare the site resistance against the design.

PERFORMANCE

Initially testing was performed on site to gather the site soil resistivity measurements via the Wenner method. The results were then modelled in the CDEGS-RESAP software suite to determine the site soil resistivity model.

The site was designed to ensure touch and step voltages are safe surrounding the DNO substation for when it is both in isolation and bonded to the private earthing system in the CDEGS-MALZ software suite. To help redtesl the site resistance the incoming HV cable trench was utilised, where both stranded conductor and rods were installed, saving on installation costs.

Since the site POC is supplied via an overhead connection all of the earth fault current will return to the source substation via the earth (since there is no metallic connection back to the source via an overhead earth wire, cable screens etc.). This resulted in a Hot" site classification, where underground utility searches were performed to confirm that no third party assets would be affected during fault conditions. TESL prodtesld a hot zone contour drawing based on the modelled site EPR so that it could be provided to OpenReach.

The FOP confirmed that the installed site resistance is lower than the design, therefore confirming the touch and step voltage are safe across the site as designed and reducing the extents of the Hot Zone Contours.

SPECIFIC REQUIREMENTS

When the site POC is provided via an overhead line extra precautions are required to excessive EPRs are not present during fault conditions.

Care must be exercised to prevent hazardous voltages being transferred to third party assets. A Hot Zone Contour drawing should be prodtesld so that OpenReach can include this in their records.

Sizing of the earthing conductors for the DNO and Private electrode were based on separate requirements. This meant that the earthing conductors for the two earthing systems needed to be sized accordingly

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If you have any issues with your installed earthing system or require a new earthing design, please get in touch with our experts at TESL.