CASE STUDY

LEVERTON BATTERY ENERGY STORAGE SCHEME

EARTHING DESIGN

Aerial View of Leverton ESS Housed Inside Building

PROJECT
Leverton Battery Energy Storage Scheme (ESS) is a new 10MW Battery ESS, located at Birchholts Farm, Leverton, LN1 2RG.

The Battery ESS connects into the Western Power Distribution (WPD) distribution network via a Teed underground 33kV cable circuit.

UCE INVOLVEMENT
UCE was contracted to undertake the earthing system design for the whole Leverton Battery ESS.

PROJECT DATES

Project Start Date:	May 2017
Submission Date:	June 2017

END CLIENT
RCD Utility Services Ltd

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 Communications Mast) and private installations. The battery storage units are housed within an over-arching structure so earthing of the structure was also considered.

To help reduce the site resistance 50m of conductor was installed in the incoming HV cable trench, resulting in a "Cold" site classification.

Once constructed, UCE 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 modelled in the CDEGS-RESAP software suite to determine the site soil resistivity model.

The site was designed in the CDEGS-MALZ software suite, 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. To help reduce the site resistance, the incoming HV cable trench was utilised, where 50m of earthing conductor was installed, saving on installation costs.

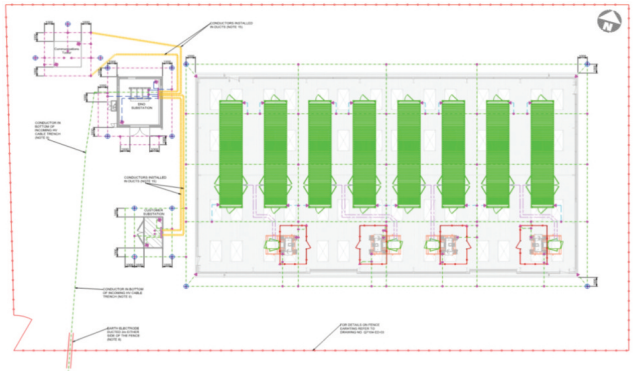
Due to the cable connection back to the source substation where the cable sheaths are bonded at both ends, a large proportion of the earth fault current will return back to the source substations via the respective cable sheaths. The ATP-EMTP software package was utilised to determine the worst case earth return fault current and the transferred voltage for faults at the source substation.

The FOP confirmed that the installed site resistance is lower than the design, confirming the touch and step voltage are safe across the site, as per the design.

SPECIFIC REQUIREMENTS

Based on the manufactures specifications, Battery ESS units utilise an IT Earthing arrangement, where the star point on the secondary side (400V) of the 33/04kV, Inverter Transformers shall be kept isolated or 'floating.'

Understanding the requirements of applying both the DNO specifications to the contestable works and the BS EN 50522 standard to the private installation so that the earthing system is correctly designed.



Leveron ESS Earth Electrode

UTILITY CONSULTANCY & ENGINEERING LTD

UTILITY CONSULTANCY & ENGINEERING LIMITED
The Business Village @ Barnsley BIC
Innovation Way
Wilthorpe, Barnsley
South Yorkshire
S75 1JL

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

01226 610 888
www.uce-ltd.co.uk