

CASE STUDY

HV EARTHING DESIGN



PROJECT BRIEF

A sufficient and effective earthing system is important for large installations such as power stations.

ERM was asked to verify the proposed earthing design against UK standards, including ERM's previous experience designing the earthing system for the new 400kV connection substation and verifying the designs for the existing 400kV and 275kV substations.

The scale of the site, its varying elevation and the proposed use of a backfill material made this a challenging project.

CHALLENGES

- Sheer size; with a site almost a kilometre across, the amount of electrode involved in calculations is taxing for even modern computing with the latest CDEGS software.
- Varying surface elevation presented a technical challenge and required the use of specialised functions within CDEGS as well as top-end hardware to process the model and keep calculation times to an acceptable level.
- Lateral variation in soil resistivity and significant depths of imported backfill material to be represented in the model.
- Staged construction of the earthing system in the vicinity of live 400kV and 275kV substations and the provision of 11kV construction supplies present particular safety hazards. ERM was asked to analyse the construction programme and design out any safety hazards associated with the 11kV power network.
- Working with multiple companies to progress the project, including international involvement

OUR APPROACH

The size of the power station earthing system, along with the adjacent interconnected sites and requirement to represent a multilayer soil model including backfill representation made the construction and processing of a CDEGS model difficult.

ERM built a bespoke top-end PC to give sufficient processing power to run this model in a timely manner. Regular liaison with the client throughout the project allowed ERM to understand the breadth of the project including associated areas such as construction techniques and installation methods proposed.

The range of practical and technical experience at ERM allowed us to not only deliver the customer's requirements but to provide advice value engineering advice, which subsequently provided significant safety improvements and savings in excess of £1M.

PROJECT OUTCOME / DELIVERABLES

The earthing design was approved from a safety viewpoint and significant cost savings were identified during value engineering both for the design itself and for its construction. The saving exceeded £1M. Safety hazards with 11kV construction supplies were identified and designed out with a pragmatic solution that required little ongoing management.

The finished product was a detailed model with the functionality required to examine, calculate and draw the above conclusions.

