

Zone Substation Earthing; project showstopper - Challenges and Solutions: A Case Study



ENGINEERS
AUSTRALIA

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Hosted by: Joint Electrical & Electronic Papers (JEEP)

DATE

Wednesday 11 March 2015

TIME

5:30pm for a 5.45pm start

Light refreshments will be served after the presentation

VENUE

Auditorium
Engineers Australia
712 Murray Street
West Perth

TICKETS (incl. GST)

Members & Students: Free
Non-members: \$30.00

REGISTRATIONS CLOSE

COB Tuesday 10 March 2015

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1.5 CPD hours



This paper discusses an earthing design for a sensitive substation project, which benefited from various field measurements. Tests verified the design forecasts and effectiveness of implemented control measures, resulting in elimination of costly mitigation (a showstopper) on nearby major underground assets and successful substation final earth commissioning.

As per Western Australia regulations, substation earthing designs must comply with AS2067:2008, which requires full compliance with other referenced documents and standards. One of these referenced standards is AS/NZS3835.1:2006 which requires that "Telecommunications exchanges shall not be installed where the maximum expected EPR at the site of the exchange is greater than 430 V for all categories of HV circuits". This criterion is fixed and independent of fault clearing time, top soil resistivity, etc., which affects both risk based and deterministic safety criterion.

The close proximity of the major Telstra exchange (less than 150m from a new zone substation 132kV/22kV) and its potential excessive mitigation costs, meant that satisfying Telstra's safety criteria was a major constraint. Other challenging factors were the close proximity of the substation to a high pressure gas valve and a CP test point, high system (132kV) fault capacity, poor site soil resistivity, limited OHEW, and the effect of neighbouring MEN on direct and indirect transfer voltages.

Various control measures were studied and cost effective ones were selected and implemented. Field measurements verified design forecasts and the effectiveness of the control measures implemented. In the final earth commissioning stage, it became apparent that the adopted control measures were absolutely necessary to control the project's identified risks. This project no longer faces potential multi-million dollar mitigation costs, resulting in significant cost savings for the customers and energised on schedule.

ABOUT THE SPEAKER

Hooman has made significant contributions to various areas of power systems over the last 20 years. He has specialised in power systems earthing, lightning and provides end-to-end solutions. He delivers and verifies comprehensive earthing designs in a well-planned, informative, effective and cost efficient manner and met critical network infrastructure needs of different industries. By implementing innovative and cost effective solutions and secure control measures, he has successfully managed risk and saved projects' mitigation costs (i.e. up to \$10 million for Balcatta substation and more than \$5 million for the MWEP transmission line projects).



His novel studies on both renewable energy and power electronics earned him his PhD and the Curtin University Chancellor's Award in 2003, Perth. He is the author of two patents, two book chapters and numerous journal and conference papers.

