

LOCATION OF SUBSTATION SITES WITH AN EARTH POTENTIAL RISE UNDER FAULT CONDITIONS ABOVE 650V (HOT SITES)

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PURPOSE AND SCOPE

Under power system fault conditions, the substation earth (local earth) can rise to a high voltage compared to a remote earth. This **elevated voltage** is termed as **Earth Potential Rise (EPR)**.

Where telecommunication services are delivered to a site the **EPR** can be sufficiently high to present a safety hazard both to personnel within the substation and to Public Telecommunications Operator (PTO) personnel remote from the site. A site is considered to be a 'Hot Site' where the **EPR** can rise above 430V rms or, above 650V rms for high reliability electricity transmission systems where high speed protection systems are employed. The higher voltage category applies to all the National Grid transmission system.

The International Telecommunications Union (**ITU**) has issued directives which recommend that protective safety measures are taken where services are delivered to Hot Sites. The Energy Networks Association has also agreed the process for managing 'Hot Sites' with BT (refer to ENA ER S36).

This register of Hot Sites is maintained by the National Grid and is issued to PTO companies who provide telecommunication services so that appropriate measures can be taken.

At joint National Grid / Distribution Network Operator (DNO) sites, the earthing systems are normally interconnected and therefore the **EPR** will be exported to the DNO sites. This register is therefore also issued to DNO companies so that they are aware of the exported EPR.

PART 1 –PROCEDURAL

1 SUBSTATIONS WITH A **EPR IN EXCESS OF 650V**

In this Technical Guidance Note, **Appendix A** lists National Grid substations where the **EPR** may be in excess of 650 V. The list is primarily intended for use by PTOs. External parties requiring additional technical information regarding this document should, in the first instance, contact Dr Dongsheng Guo (Policy Development Engineer, National Grid) by phone (01926656033) or e-mail (dongsheng.guo@nationalgrid.com).

The work undertaken to service this document is based upon best available information to National Grid. On occasions, there may be benefit gained from considering the contribution to an earthing system from interconnected 3rd party cable data where this information is made available.

Where **detailed** information regarding the **EPR** zones at a substation is required, this should be requested by PTO/DNO companies on a site by site basis, using the same contact details **as above**.

Telecommunication services provided on copper circuits to National Grid substations shall be installed following the guidance contained in TGN(E)133 and TGN(E)207. It should be noted that it is National Grid policy to fit appropriate line isolation regardless of the calculated site **EPR**.

Services provided by other utilities may also need protection at these locations and appropriate specialist advice should be sought.

2 FORMS AND RECORDS

Not applicable.

PART 2 - DEFINITIONS AND DOCUMENT HISTORY DEFINITIONS

3 DEFINITIONS

Earth Potential Rise (EPR) The voltage difference between the substation metalwork and earth due to fault current. It is calculated from the product of the total substation earth electrode impedance and the current flowing through it. EPR was previously known, in many national and industrial documents, as RoEP (Rise of Earth Potential).

4 AMENDMENTS RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	November 1998	New document	Brian Baker Network Control and Telecommunications	Paul Donnelly Network Control and Telecommunications Manager
2	April 2006	Updated from issue 1	Alan Ainsley Asset Strategy	Trevor Jones Asset Policy Manager
3	June 2006	Updated to include ROEP values	Alan Ainsley Asset Strategy	Trevor Jones Asset Policy Manager
4	July 2007	Updated with new ROEP values	Alan Ainsley Asset Strategy	Ursula Bryan Asset Policy Manager
5	September 2008	Updated with new ROEP values for 28 sites. Sites Added: Bradwell 132kV, Lister Drive 275kV Ninfield 400kV Oldbury on Severn 132kV Salt End North & South 275kV Stella North, South 132kV Stella West 275kV, Uskmouth 275kV Sites Removed: Coryton South 400kV Hinkley Point 400kV	Alan Ainsley Asset Strategy	Ursula Bryan Asset Policy Manager
6	February 2012	Addition/removal of sites due to ownership changes Updated list of NG 'HOT sites' following comprehensive review of earthing calculations. RoEP values excluded from table in Appendix A.	Dongsheng Guo Policy	Ursula Bryan Policy Manager

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
7	September 2014	New entries since Issue 6: BODE4, BRWA2, CLEH4, DAMC4, KNAR2, LEIS1, MAWO4, RHIG4, STOB4, TILB4. Entries removed from Issue 6: BARK6, BERK1, BLYT2, CITR4, COWE1, DINO4, FAWL4, HARK4, MEAF1, NHYD2, NOTR1, SEAB4, SHEC2, SHBA4	Dongsheng Guo Asset Policy	Ursula Bryan Asset Policy Manager
8	September 2016	New entries since issue 7: BICF4, CONQ4, FLIB4, HEDO2, SPLN4, Entry removed from issue 7: DEES4,	Dongsheng Guo Asset Policy	Stewart Whyte Asset Policy Manager

5 IMPLEMENTATION

5.1 Audience Awareness

Audience	Purpose Compliance (C) / Awareness (A)	Notification Method Memo / letter / fax / email / team brief / other (specify)
External customers	A	Email

5.2 Training Requirements

Training Needs N/A / Informal / Workshop / Formal Course	Training Target Date	Implementation Manager
N/A	N/A	N/A

5.3 Compliance

Not applicable.

5.4 Procedure Review Date

2 year from publication date.

PART 3 – GUIDANCE NOTES AND APPENDICES

6 REFERENCES

BS EN 50522	Earthing of power installations exceeding 1kV a.c.
TGN(E) 133	Protection Against Rise of Earth Potential and Induced Voltages on Telecommunication Cables at Substation Sites
TGN(E) 207	Telecommunications Line Isolation Installations at New Substations

EA ER S36-1

Energy Networks Association, Engineering Recommendation, S36-1,
Identification and Recording of 'Hot Sites' – Joint Electricity Industry /
British Telecom Procedure, Issue 1, June 2007