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Engineering Recommendation G84

Issue 2 2013

Recommendations for the connection of mobile Generating Sets to public distribution networks

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
Issue 2	March, 2013	Minor revision of Issue 1 to reflect changes to legislation and Standards since 2005. Converted into the new ENA Engineering Recommendation (EREC) template and updated in accordance with Engineering Recommendation G0 Issue 1 2012 *Rules for structure, drafting and presentation of ENA engineering documents*. Retained text from Issue 1 re-assigned into the revised structure of the template. This issue includes the following principal editorial and technical changes: Foreword and Introduction added and explanatory information included. Clause 1 PURPOSE deleted and incorporated into Foreword and Introduction. Clause 2 SCOPE changed to Clause 1 Scope: Updated reference to BS 7430 for connection of small portable Generating Sets. Added new paragraph relating to possible issues for networks with Small Scale Embedded Generators (SSEG). Clause 3 REFERENCES changed to Clause 2 Normative references. Clause 4 DEFINITIONS changed to Clause 3 Terms and definitions: New definitions added for “Limited Access Area” and “Prohibited Access Area”.

		Clause 4 Generic Generating Set requirements: BS 5499-11 withdrawn - added requirement to comply with The Health and Safety (Safety Signs and Signals) Regulations, 1996. Added requirement for secondary containment to have the capacity to take at least 110% of the volume that the fuel tank can hold. Updated reference to “oil storage” Regulations. Clause 5 General considerations: 5.1 Safety and environment: Added list of hazards associated with Generating Sets to be identified and addressed. 5.5 Protection: Changed “protections” to “requirements”. Updated reference to G59/2. Added new requirement for SSEG to be isolated before connection of mobile Generating Sets. 5.6 Selection of Generating Sets: Added reference to ETR 122. 5.11 Generic safety precautions: Added reference to the Traffic Signs Manual — Chapter 8 and The Carriage of Dangerous Goods (CDG) and Use of Transportable Pressure Equipment Regulations, 2009. Added note regarding small load exemption for fuel less than 1 000 litres. Clause 6 Connection procedures for small portable Generating Sets (<10 kVA): 6.2 Earthing: Added note relating to the care which should be taken in following the connection, operating and testing instructions associated with smaller Generating Sets. Added note relating to acceptability of earth electrode resistance in line with BS 7671. Clause 8 Connection procedures for LV generation onto a network: Added cross-reference to new requirement on SSEG in clause 5.5. 8.4 Synchronising criteria: Changed requirement for fuses not to exceed 500 mA (in accordance with GS 38). Added reference to ENA TS 37-2 for provision of voltage supply facilities. Clause 9 Connection procedures for LV to HV Step-up Unit: 9.8 Bulk fuel tanks/refuelling: Added new requirements for mobile bowsers. Bibliography added. Details of all other technical, general and editorial amendments are included in the associated Document Amendment Summary for this Issue (available on request from the Operations Directorate of ENA).

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Foreword

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from the date of publication. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is “EREC G84”, which replaces the previously used abbreviation “ER G84”.

This Engineering Recommendation replaces and supersedes Engineering Recommendation G84 Issue 1 February 2005.

It is intended that this document will be used by Distribution Network Operators (DNOs) as a guidance document for the temporary connection of mobile Generating Sets that are under a DNO’s control.

Where the term “shall” or “must” is used in this document it means the provision is mandatory. Where the term “should” is used in this document it means the provision is a recommendation. The term “may” is used to express permission.

NOTE: Commentary, explanation and general informative material is presented in smaller type, and does not constitute a normative element.

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Introduction

The document is applicable to situations where a mobile Generating Set is operating in parallel with the public distribution network or where the Generating Set is operating as a standalone unit (i.e. island mode providing a supply to one or more customers).

This document should be used in conjunction with any associated documentation provided by the DNO and/or the Generating Set provider.

Adopting a common approach to the use of mobile Generating Sets will assist in the safe and efficient transfer of mobile Generating Sets and operators between companies, particularly under emergency conditions.

1 Scope

This document describes recommended working procedures for the connection of small portable Generating Sets and larger mobile Generating Sets for the purposes of providing a temporary supply to customers or for network support. It addresses direct connections to the Low Voltage network and connections via a Step-up Unit to the High Voltage network.

The following operating scenarios are addressed:

- Low Voltage connection – dead on/off.
- Low Voltage connection – synchronise on/off.
- High Voltage connection – dead on/dead off.
- High Voltage connection – synchronise on/dead off.

Protection parameters and settings are specified and guidance is given on the acceptable levels of power quality that should be delivered to customers supplied by mobile Generating Sets.

Guidance is given on the environmental issues that will need to be addressed when connecting and operating mobile Generating Sets.

This Engineering Recommendation does not address the provision of supply from small standalone portable Generating Sets, where typically the user is only provided with a socket outlet. For requirements on the use of this type of small portable Generating Set the reader is referred to the requirements detailed in BS 7430:2011, section 7.2 and BS 7671 regulation 551-04-06.

Whilst the document does not include any detailed recommendations for connecting temporary supplies where Small Scale Embedded Generation (SSEG) may be connected to DNO networks, it is important to recognise the possible issues associated with such supplies (see 5.5).

Generating Sets with an HV output are not covered in this document.

2 Normative references

The following referenced documents, in whole or part, are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 5467:1997+A3 2008, *Specification for 600/1000V and 1900/3300V armoured electric cables having thermosetting insulation*

BS 6883:1999, *Elastomer insulated cables for fixed wiring in ships & on mobile & fixed off-shore units. Requirements & Test Methods*

BS 7430:2011, *Code of Practice for Earthing*

BS 7671:2008, *Requirements for electrical installations (IET Wiring Regulations Seventeenth Edition)* as amended by Amendment No.1:2011

BS EN 12601:2010, *Reciprocating internal combustion engine driven generating sets — Safety*

BS EN 50160:2010, *Voltage characteristics of electricity supplied by public electricity networks*

BS EN 50525-2-71:2011, *Electric cables. Flexible cords rated up to 300/500V, for use with appliances and equipment intended for domestic, office & similar environments*

BS EN 60034-1:2010, *Rotating Electrical Machines. Rating and Performance*

BS EN 60034-5:2001, *Rotating Electrical Machines. Degrees of protection provided by the integral design of rotating electrical machines (IP Code) Classification*

BS EN 60034-22:2009, *Rotating Electrical Machines. AC Generators for reciprocating internal combustion (RIC) engine driven Generating Sets*

BS EN 60228:2005, *Conductors of insulated cables*

BS EN 61008-1:2004+A13:2012, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). General rules*

BS EN ISO 20344:2011, *Personal protective equipment. Test methods for footwear*

BS EN ISO 20345:2011, *Personal protective equipment. Safety footwear*

IEC 60092-350 ed3.0 (2008) *Electrical installations in ships - Part 350, General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications*

IEC 60227:2012, *Polyvinyl chloride insulated cables of rated voltages up to & including 450/750V*

IEC 60228:2005, *Conductors of insulated cables*[1]

IEC 60332-1 ed1.0 (2004), *Tests on electric and optical fibre cables under fire conditions Part 1-1: Test for vertical flame propagation for a single insulated wire or cable*

Other publications

[N1] *The Noise Emission in the Environment by Equipment for use Outdoors Regulations,* 2001

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[1] Identical to BS EN 60228:2005.

[N2] *The Electromagnetic Compatibility (EMC) Regulations,* 2007

[N3] *The Supply of Machinery (Safety) Regulations,* 2008

[N4] *New Roads and Street Works Act* (NRSWA*),* 1991

[N5] *The Health and Safety (Safety Signs and Signals) Regulations,* 1996

[N6] *The Control of Pollution (Oil Storage) (England) Regulations,* 2001

[N7] *The Water Environment (Oil Storage) (Scotland) Regulations,* 2006

[N8] *The Control of Pollution (Oil Storage) Regulations (Northern Ireland)*, 2010

[N9] *The Electricity at Work Regulations,* 1989

[N10] *The Electricity Safety, Quality and Continuity Regulations* (ESQCR), 2009

[N11] ENA Engineering Recommendation (ENA ER) P28:1989, *Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment in the United Kingdom*

[N12] ENA Engineering Recommendation (ENA ER) P29:1990, *Planning limits for voltage unbalance in the United Kingdom*

[N13] ENA Technical Specification (ENA TS) 37-2:2005, *LV distribution fuse-boards*

[N14] ENA Engineering Recommendation (ENA ER) G59/2:2010, *Recommendations for the connection of generating plant to the distribution systems of licensed Distribution Network Operators*

[N15] ENA Engineering Recommendation (ENA ER) G5/4-1:2005, *Planning Levels for harmonic Voltage Distortion and the Connection of Non-Linear Equipment to Transmission Systems and Distribution Networks in the United Kingdom*

[N16] ENA Engineering Technical Report (ENA ETR) 122:2002, *Guide to the application of Engineering Recommendation G5/4 in the assessment of harmonic voltage distortion and connection of non-linear equipment to the electricity supply system in the U.K*.

[N17] Traffic Signs Manual — Chapter 8:2009, *Traffic Safety Measures and Signs for Road Works and Temporary Situations*

[N18] *The Carriage of Dangerous Goods (CDG) and Use of Transportable Pressure Equipment Regulations*, 2009 (as amended)

[N19] HSE Guidance Note GS 38, *Electrical test equipment for use by electricians* (revised February 1995)

[N20] ENA Technical Specification (ENA TS) 41-24 Issue 1:2009 – Addendum, Section 15, Incorporated November 2009, *Guidelines for the design, installation, testing and maintenance of main earthing systems in substations*

[N21] EEC PPE Directive 89/686/EEC Annex II, *Personal Protective Equipment*

[N22] ASTM International ASTM F1117-03:2008, *Standard Specification for Dielectric Footwear*

[N23] Energy Networks Association publication ALP2-1:2010, *Protection Assessment Panel – Assessed Relays*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Access Area

3.1.1
Limited Access Area (LAA)
fenced or barriered area where access is limited to only those persons essential to the operation of the Generating Set/Step-up Unit

3.1.2
Prohibited Access Area (PAA)
fenced or barriered area where access is prohibited to prevent danger to persons during connection, operation and disconnection of the Generating Set/Step-up Unit

3.2
alternator
AC synchronous generator

3.3
dead
at or about zero potential with respect to earth

3.4

dead off
power output of the Generating Set is disconnected from the DNO system where there is an absence of mains voltage at the time of disconnection

3.5
dead on
power output of the Generating Set is connected to the DNO system where there is an absence of mains voltage at the time of connection

3.6
double insulated
insulation comprising both basic insulation and supplementary insulation

NOTE: Supplementary insulation is independent insulation applied to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation.

3.7
Distribution Network Operator (DNO)
company responsible for making technical connection agreements with customers seeking connection of equipment to its distribution network

3.8
Generating Set
prime mover used to produce mechanical energy and an AC alternator to convert the mechanical energy into electrical energy

NOTE: Also included are the components for transmitting the mechanical energy, (i.e. couplings, gearboxes, etc.) and, where applicable, bearing and mounting components.

3.9
High Voltage (HV)
any voltage exceeding Low Voltage