



Engineering Report 126

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Guidelines for actively managing voltage levels associated with the connection of a single Distributed Generation plant

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**Operations Directorate
Energy Networks Association
6th Floor, Dean Bradley House
52 Horseferry Rd
London
SW1P 2AF**

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Amendments since publication

Issue	Date	Amendment
Issue 2	December, 2012	<p>Minor revision of Issue 1 to align with the new ENA Engineering Report (EREP) template and Engineering Recommendation G0 Issue 1 2012 <i>Rules for structure, drafting and presentation of ENA engineering documents</i>.</p> <p>This issue does <u>not</u> include any principal technical changes.</p> <p>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).</p>

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Foreword

This Engineering Report (EREP) 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 "EREP 126", which replaces the previously used abbreviation "ETR 126".

This Engineering Report replaces and supersedes Engineering Technical Report 126 Issue 1 2004

This issue constitutes a minor revision of ETR 126 Issue 1 and has been updated to incorporate changes resulting from revision of references within the document and developments in voltage control relays that cater for connection of Distributed Generation.

Introduction

The purpose of this Engineering Report is to provide Distribution Network Operators (DNOs) with guidance on how to employ Active Management solutions to overcome voltage control limitations associated with the connection of a single Distributed Generation (DG) plant. The solutions presented in this report should not be seen as prescriptive or exhaustive in that there could be circumstances where a DNO is unable to accept the solutions proposed here; or the DNO may wish to employ an alternative solution(s).

NOTE: Active Management solutions are designed to optimise the utilisation of distribution networks in terms of their capability to accept the connection of Distributed Generation. In this respect Active Management solutions are one of the methods available to help facilitate the connection of more distributed generation in support of Government targets for renewable generation and combined heat and power (CHP).

1 Scope

The solutions described in this Engineering Report are based on a project carried out for Future Energy Solutions (FES) on behalf of the Department for Business, Innovation and Skills (BIS), by EA Technology Limited (EATL) [N1]. The FES project considered three areas where basic active network management techniques could facilitate the connection of more Distributed Generation (DG): Fault level management, Voltage control management and Power flow management. This report only considers solutions to overcome operational limitations related to the control of steady state voltage on distribution networks associated with the connection of a single DG plant. However, when a network designer is assessing the connection requirements for DG it will also be necessary to consider the possible impact of voltage step changes caused by the sudden connection/disconnection of DG and any Constraints associated with power flow and fault levels, noting that solutions to these issues are outside the scope of this report.

The principles described in this report though written for single Distributed Generation (DG) installations may in some cases be extrapolated to cater for networks with multiple DG installations. However, the possible need for scheduling and other commercial arrangements is outside of the scope of this report.

This report describes conceptually five basic Active Management solutions for overcoming the variations in network voltage that could result from the connection of Distributed Generation plant. Each solution is presented as a stand-alone option.

The solutions and guidance provided in this report should not be seen as prescriptive; it will be for the DNO to determine if the solutions as described here can be implemented for any particular situation on the network. In making this determination the DNO will be expected to consider the ability of each solution to deliver the required level of voltage control necessary to ensure that the network remains compliant with the requirements of the Distribution Code [1] and the Electricity Safety, Quality and Continuity Regulations [2]. This report also provides guidance on situations where a particular solution is most likely to be suitable.

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.

Other publications

[N1] K/EL/00303/00/01/REP: *Solutions for the Connection and Operation of Distributed Generation (version F)*: May 2003 (often referred to as the BAM report). Document developed by EATL under contract to FES.

3 Terms and definitions

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

3.1

Active Management

methodology by which the DNO and the Generator monitor their respective plant with the intention of reacting to network or generation changes in order to ensure that the network and generation continue to operate within safe and prescribed limits

NOTE: Monitoring means manual, electronic or any other form of monitoring that is suitable for the particular installation.

3.2

Automatic Voltage Control (AVC)

system responsible for maintaining the voltage at a node within pre-set limits by controlling the on-load tap changer of a transformer

3.3

Constraint

condition where the Generator has agreed to reduce the export from his Distributed Generation plant in some way in accordance with the requirements of another party

NOTE: For the solutions described in this report the other party will normally be the DNO.

3.4

Distribution Network Operator (DNO)

organisation that owns and/or operates a distribution network and is responsible for agreeing the connection of Distributed Generation to that network

NOTE 1: A DNO might also be referred to as a Distributor.

NOTE 2: For the purposes of this report the term DNO also includes the owners of the Scottish 132 kV and lower voltage networks.

3.5

Distributed Generation (DG)

generating plant connected to the distribution network

NOTE: A generating plant is an installation comprising one or more generating units.

3.6

Generator

person who generates electricity under licence or exemption from Section 4.1(a) of the Electricity Act 1989 [3] or the Electricity (Northern Ireland) Order 1992 [4]

3.7

Line Drop Compensation (LDC)

system employed on some networks (typically at 33/11 kV substations), as part of the AVC system, which adjusts the substation LV busbar voltage in response to changes in network demand to compensate for changes in the voltage drop along the network circuits