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Guidelines for actively managing power flows associated with the connection of a single Distributed Generation plant

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Amendments since publication

Issue	Date	Amendment
Issue 2	December, 2012	Minor revision of Issue 1 to align with the new ENA Engineering Report (EREP) template and Engineering Recommendation G0 Issue 1 2012 *Rules for structure, drafting and presentation of ENA engineering documents*. This issue does not include any principal technical changes. 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 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 124”, which replaces the previously used abbreviation “ETR 124”.

This EREP replaces and supersedes Engineering Technical Report 124 Issue 1 2004.

ENA Engineering Recommendation G75/1, *Recommendations for the connection of embedded generation plant to public distribution networks above 20 kV or with outputs over 5 MW* has been withdrawn and requirements are now included in ENA Engineering Recommendation G59/2, *Recommendations For The Connection Of Generating Plant To The Distribution Systems Of Licensed Distribution Network Operators.* References in this EREP have been revised accordingly.

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 power flow 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 that will allow higher levels of power flow export than that which would be allowed under the solutions described in this report. For these reasons this report should be seen as the starting point for discussions between the DNO and the Generator when looking to implement an Active Management solution to overcome a power flow constraint.

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 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: Fault level management, Voltage control management and Power flow management. This report only considers solutions to overcome power flow Constraints associated with the connection of a single generation plant. However, when a network designer is assessing the connection requirements for Distributed Generation it will also be necessary to consider Constraints associated with voltage control and fault levels. Solutions to these two issues are out of scope for this report.

The principles described in this report though written for single Distributed Generation (DG) installations can 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 four solutions for increasing the utilisation of the power flow capability of the distribution network, treating each solution as a stand-alone option as an alternative to overcoming power flow Constraints by traditional reinforcement.

The solutions and guidance provided in this report should not be seen as being 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 ratings of plant both in the forward and reverse direction. It is also the responsibility of the DNO to ensure that the network remains compliant with the requirements of the Distribution Code [1] and the ESQC Regulations [2]. This report also provides guidance on situations where a particular solution is most likely to be suitable.

The solutions described in this report are generally applicable to Distributed Generation plants connected to high voltage networks supplied by two or more circuits operating in parallel at 132 kV or below. Although not described in this report it is possible to apply some of the principles of the solutions described here to single circuit connections.

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.

[N2] ENA Engineering Recommendation G59, *Recommendations For The Connection Of Generating Plant To The Distribution Systems Of Licensed Distribution Network Operators*

[N3] ENA Engineering Recommendation P28, *Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment in the United Kingdom*

[N4] ENA Engineering Recommendation P2/6, *System Security*

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
Arm
activate a mechanism for implementing a network Constraint when the value of the monitored parameter exceeds the set operating point

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 Demand

3.4.1
Demand – specified (D)
demand (specified by the DNO) of the substation or network node, which is used as part of the calculation for determining the agreed level of export from a Distributed Generation plant under the relevant Active Management solution

NOTE: The maximum value of D is the maximum demand of the relevant substation or network node.