

## Company Directive

### POLICY DOCUMENT: SD2/7

### Relating to 132kV System Design

#### Policy Summary

This document describes the standard requirements for the design of the 132kV system.

Reference is also made to the Distribution Code, Grid Code, ENA Engineering Recommendations P2, P18, P28, P29, G5, G59, G99, G74 and to Western Power Distribution Engineering Directives POL:SD1 and POL:TP2 (as amended).

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**Implementation Date:** September 2018

**Approved by**

  
**Network Strategy and Innovation Manager**

**Date:**

12/9/2018

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## **IMPLEMENTATION PLAN**

### **Introduction**

POL: SD2 specifies the high level requirements for 132kV System Design.

### **Main Changes**

References to G99 have been added.

### **Impact of Changes**

Power Generating Modules and Power Park Modules connected from 27<sup>th</sup> April 2019 shall comply with ENA EREC G99 unless the generator concluded a final and binding contract for the purchase of the main generating plant before 17<sup>th</sup> May 2018 and notified WPD of this by 17<sup>th</sup> November 2018.

### **Implementation Requirements**

Managers shall ensure that staff involved in the design of the 132kV network, or with the appraisal / approval of 132kV capital sanctions, are aware of, and follow, the requirements of this document.

### **Implementation Timescale**

Document implemented on issue.

## REVISION HISTORY

Document Revision and Review Table		
Date	Comments	Name
September 2018	<ul style="list-style-type: none"><li>• A reference to ENA EREC G99 has been added to Section 2.3 and Appendix B.</li></ul>	Andy Hood
September 2017	<ul style="list-style-type: none"><li>• Section 2.1.1 relating to the requirements for networks that include active load management has been added.</li></ul>	Andy Hood
September 2014	<p>The following page amendments have been made:</p> <ul style="list-style-type: none"><li>• Links to the Distribution Code, Grid Code and to ENA Engineering Recommendations updated.</li><li>• ENA Engineering Recommendation version / issue numbers removed and replaced with the term “as amended”.</li><li>• 132kV system complexity shall be in accordance with ENA Engineering Recommendation P18.</li></ul>	Andy Hood

## 1.0 INTRODUCTION

- 1.1 This document describes the standard requirements for the design of the 132kV system and details the security, supply quality, safety, asset utilisation and capital investment requirements. Where any difficulty is encountered with the application of this policy, the author should be notified, who will consider if a variation to this policy is appropriate.
- 1.2 The practical details of the application of this policy are contained in a range of ST documents with a reference beginning ST:SD2.
- 1.3 Where the term “load” is used within the document this refers to the load associated with both generation and demand.

## 2.0 POLICY

The design of the 132kV system shall satisfy the requirements of the [Distribution Code of Licensed of Distribution Network Operators of Great Britain](#) and also the relevant requirements of the [Grid Code](#).

### 2.1 System Security and Complexity

132kV systems shall be designed to provide a standard of security not less than that set out in [ENA EREC P2](#) and to satisfy the requirements of [ENA EREC P18](#), Complexity of 132kV Circuits, as amended.

- 2.1.1 Where the load is actively managed, e.g. using Active Network Management (ANM), soft intertrip, conventional intertripping or other equivalent load constraint / control schemes, the network shall satisfy the following criteria:

(a) When the effect of active load management schemes are disregarded (i.e. the network is modelled without such schemes):

- The maximum load on any overhead circuit shall not exceed 110% of its rating
- The maximum load on any item of plant or equipment, excluding overhead lines, shall not exceed 125% of its rating
- The voltage on the 132kV network shall remain within the following limits: Nominal Voltage +/- 12%

(b) Active load management systems shall, as far as possible, include watchdog and communications failure facilities that curtail the load in the event of a scheme failure. Such systems shall be designed to curtail the load before the thermal ratings of plant and equipment are exceeded.

(c) In the event of the failure of an active load management system or its associated communications / control systems, no more than 50MW of load shall be curtailed per minute and no more than 200MW of load shall be curtailed in total, across all voltage levels.

2.1.2 Improvements to system reliability will be considered in accordance with ST:AM5C and POL:FI 06/04/01.

## 2.2 Supply Quality

132kV systems will be designed:

- to have a voltage regulation which will allow normal operating voltages to be achieved at a lower voltage side of 132kV/lower voltage transformers after Automatic Voltage Control Operation under normal credible outage or fault conditions.
- to have a voltage step change of less than 10% measured at customer's terminals when supplied at 132kV and at the lower voltage busbars of 132kV/lower voltage substations, after fault clearance, operation of auto-close schemes within a 5s period, and generator automatic voltage regulator (AVR) operation, but before transformer automatic voltage control (AVC) operation, for any credible outage or fault condition. This figure may be relaxed to 12% for National Grid "Secured Events", as defined in the GB Security and Quality of Supply Standard, when agreed with the Design and Development Manager.
- to ensure that new connections comply with the voltage unbalance limits contained in [ENA EREC P29](#)
- to ensure that new connections comply with the voltage fluctuation requirements of [ENA EREC P28](#)
- to ensure that new connections comply with the limits for harmonics in the UK contained in [ENA EREC G5](#)

## 2.3 Safety

132kV systems shall:

- be protected in accordance with POL:TP2
- comply with [ENA EREC G59](#) or [ENA EREC G99](#), as applicable
- to take account of the fault level calculation methodology detailed in [ENA EREC G74](#)
- operate within equipment design ratings including any appropriate cyclic or short term rating as defined in the appropriate Engineering Instructions and Directives.

## 2.4 **Asset Utilisation and Capital Investment**

132kV systems will be designed:

- using equipment approved by the Policy Manager.
- using equipment of standard capacities.
- to improve asset utilisation unless the system security, supply quality or safety criteria of this policy will be impaired.
- for the lowest lifetime cost in accordance with POL:AM5 and POL:FI 06/04/01
- to ensure correct operation in parallel with the National Grid.

## 3.0 **BACKGROUND INFORMATION**

The requirements of this policy have evolved over a period of time and represent tried and tested principles.

Engineering Directive POL:SD1 contains further information on the fundamental aims of system design.

## **APPENDIX A**

### **SUPERSEDED DOCUMENTATION**

This Document supersedes POL:SD2/6 dated September 2017 which has now been withdrawn

## **APPENDIX B**

### **ANCILLARY DOCUMENTATION**

ENA EREC P2, Security of Supply

ENA EREC P18, Complexity of 132kV Circuits

ENA EREC P29, Planning limits for voltage unbalance in the United Kingdom

ENA EREC P28, Planning limits for voltage fluctuations caused by Industrial, Commercial and Domestic equipment in the United Kingdom

ENA EREC G5, Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission systems and distribution networks in the United Kingdom

ENA EREC G59, Recommendations for the connection of private generating plant to the distribution systems of Licensed Distribution Network Operators

ENA EREC G99, Recommendations for the connection of generating equipment in parallel with public distribution networks on or after 27<sup>th</sup> April 2019

ENA EREC G74, Procedure to meet the requirements of IEC 60909 for the calculation of short-circuit currents in three-phase AC power systems

GB Security and Quality of Supply Standard

POL:AM5, Technical Appraisal, Approval and Post Investment Appraisal for Network Relating Capital projects

ST:AM5C, Technical Appraisal Approval and Post Investment Appraisal for Network Related Capital Projects

POL:FI 06/04/01, Capital expenditure and project management - Investment appraisal, financial recommendation, and approval of capital sanctions

## **APPENDIX C**

### **KEY WORDS**

132kV, system, design, security, unbalance, fluctuation, harmonics, utilisation.