



**GRID CODE  
CONSULTATION DOCUMENT**

**Grid Code Changes to Appendix 5 of the Connection  
Conditions: Technical Requirements for Low  
Frequency Relays**

**The purpose of this document is to consult on the above Grid Code Modification Proposal with authorised electricity operators liable to be materially affected by the proposed changes and forms the basis of the subsequent Report to the Authority**

Consultation Ref	A/06
Issue	1
Date of Issue	12 <sup>th</sup> April 2006
<b>Responses required by</b>	<b>10<sup>th</sup> May 2006</b>
Prepared by	National Grid

## DOCUMENT LOCATION

National Grid website:

<http://www.nationalgrid.com/uk/Electricity/Codes/gridcode/consultationpapers/>

## DISTRIBUTION

Name	Organisation
AEO's	Various
GCRP Members/Alternates	Various
Interested Parties	Various
National Grid Website	

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**A. INTRODUCTION**

1. Paragraph 2 of Condition C14 of the Transmission Licence granted to the National Grid Electricity Transmission plc ("National Grid") provides that National Grid shall, in consultation with authorised electricity operators liable to be materially affected thereby, periodically review the Grid Code and its implementation. That paragraph also requires National Grid, following such review, to send to the Authority:-
  - (a) a report on the outcome of such review;
  - (b) any proposed revisions to the Grid Code as National Grid (having regard to the outcome of such review) reasonably thinks fit for the achievement of the objectives set out in sub-paragraph (b) of Condition C14 of the Transmission Licence; and
  - (c) any written representations or objections from authorised electricity operators (including any proposals by such operators for revisions to the Grid Code not accepted by National Grid in the course of the review) arising during the consultation process and subsequently maintained.
2. This review is concerned with amending Appendix 5 of the Grid Code Connection Conditions that includes an indication of the technical requirements of Low Frequency Relays used as part of the automatic low frequency demand disconnection scheme specified under Operating Code OC6.6. The proposed change is to ensure that the Grid Code requirements are consistent with those contained in Energy Networks Association (ENA) Technical Specification 48-6-5 Issue 1, 2005, used by the Distribution Network Operators.
3. The proposed changes to the Grid Code were discussed with the Grid Code Review Panel on 23<sup>rd</sup> February 2006. Panel Members agreed that having taken account of comments received, National Grid should issue a Consultation Paper.
4. The revisions to the Grid Code proposed by National Grid and sent to the Authority, require approval by that body and will, if approved, come into force on such date (or dates) of which you will be notified by National Grid, in accordance with the Authority's approval.
5. Comments should be sent to National Grid by 10<sup>th</sup> May 2006 as detailed in section C. The comments will be reviewed and responded to.
6. Unless otherwise marked as confidential any responses including those containing objections to the proposals which are sustained will be published on our website.

## **B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS**

### **7. Background**

- 7.1 The electricity system in Great Britain is protected against system collapse due to a severe fall in system frequency by the national automatic low frequency demand disconnection scheme specified under Grid Code OC6.6. This was originally conceived by the CEGB and the Scottish companies in the late 1960's and further developed in the 1970's and 1980's. In the event of a large fall in system frequency caused by very severe generation deficits beyond normal planning and operational security standards, the relays are specified to operate to disconnect customer demand in stages. In total, up to 60% of system demand in England and Wales (and 40% in Scotland) can be disconnected by the Low Frequency Relays.
- 7.2 An indication of the technical requirements for these relays can be found in Appendix 5 to the Connection Conditions and is referenced from CC.6.4.3. Further requirements on National Grid and Distribution Network Operators relating to the settings and operation of the automatic low frequency demand disconnection scheme are included in OC6.6.
- 7.3 A review of the relay settings and overall performance of the scheme carried out by National Grid identified the need to replace the old slow relays with modern fast acting ones, in addition to some setting changes. Some relays have already been replaced by the DNOs but for the remaining ones, a DNO replacement programme over their Price Control Review period and funding was agreed by Ofgem in 2002.
- 7.4 National Grid has supported the DNOs and the Energy Network Association subgroup 'Protection Relay Assessment and Approval Panel' to ensure that the specification and functional testing for approval of modern replacement relays was adequate and consistent. Relays from a number of manufacturers have now been approved by the ENA.
- 7.5 Based on this experience, the ENA introduced during 2005, a technical specification on functional test requirements for voltage and frequency protection relays. This specification covers the functional testing of Low Frequency Relays required to meet the Grid Code CC.A.5. It also includes an additional technical requirement on accuracy not specified under CC.A.5.1.1.

### **8. Proposed Changes**

- 8.1 It is proposed that the technical requirements included in CC.A.5.1.1 are updated to line up with the ENA technical specification and functional test requirements.
- 8.2 The changes would ensure consistency between the Grid Code technical requirements and the ENA's technical specification used by the DNOs. This would also improve transparency by publicising the

functional test requirements that embedded Low Frequency Relays will be required to meet.

8.3 The proposed changes to Grid Code CC.A.5 are shown in Appendix 1.

**C. RESPONSES**

9. This section will contain a summary of responses received during the Consultation and will be completed as part of the Report to the Authority.

10. Your formal responses may be:-

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**Appendix 1**

**Proposed Connection Conditions – Appendix 5 Changes**

APPENDIX 5

TECHNICAL REQUIREMENTS  
**LOW FREQUENCY RELAYS FOR THE AUTOMATIC**  
**DISCONNECTION OF SUPPLIES AT LOW FREQUENCY**

CC.A.5.1 **LOW FREQUENCY RELAYS**

CC.A.5.1.1 The **Low Frequency Relays** to be used shall be in accordance with the requirements of the **Bilateral Agreement**. They should have a setting range of 47.0 to 50Hz and be suitable for operation from a nominal AC input of 63.5, 110 or 240V. The following general parameters on the requirements of approved **Low Frequency Relays** for automatic installations is given as an indication, without prejudice to the provisions that may be included in a **Bilateral Agreement**:

- (a) **Frequency** settings: 47-50Hz in steps of ~~0.05Hz~~ or ~~better,~~ preferably 0.01Hz;
- ~~(b) Measurement period~~ settings: ~~Within a minimum selectable settings range of 4 to 6 cycles;~~
- ~~(b)e~~ Operating time: Between 100 and 150ms dependent on measurement period ~~setting;~~
- ~~(c)d~~ Voltage lock-out: Selectable within a range of 55 to 90% of nominal voltage;
- ~~(d)e~~ Facility stages: One or two stages of **Frequency** operation;
- ~~(e)f~~ Output contacts: Two output contacts per stage to be capable of repetitively making and breaking for 1000 operations.
- (f) Accuracy: 0.01 Hz maximum error under reference environmental and system voltage conditions.

0.05 Hz maximum error at  
8% total harmonic distortion  
Electromagnetic  
Compatibility Level.

CC.A.5.2

**LOW FREQUENCY RELAY VOLTAGE SUPPLIES**

CC.A.5.2.1

It is essential that the voltage supply to the **Low Frequency Relays** shall be derived from the primary **System** at the supply point concerned so that the **Frequency** of the **Low Frequency Relays** input voltage is the same as that of the primary **System**. This requires either:

- (a) the use of a secure supply obtained from voltage transformers directly associated with the grid transformer(s) concerned, the supply being obtained where necessary via a suitable automatic voltage selection scheme; or
- (b) the use of the substation 240V phase-to-neutral selected auxiliary supply, provided that this supply is always derived at the supply point concerned and is never derived from a standby supply **Generating Unit** or from another part of the **User System**.

CC.A.5.3

**SCHEME REQUIREMENTS**

CC.A.5.3.1

The tripping facility should be engineered in accordance with the following reliability considerations:

(a) Dependability

Failure to trip at any one particular **Demand** shedding point would not harm the overall operation of the scheme. However, many failures would have the effect of reducing the amount of **Demand** under low **Frequency** control. An overall reasonable minimum requirement for the dependability of the **Demand** shedding scheme is 96%, ie. the average probability of failure of each **Demand** shedding point should be less than 4%. Thus the **Demand** under low **Frequency** control will not be reduced by more than 4% due to relay failure.

(b) Outages

Low **Frequency Demand** shedding schemes will be engineered such that the amount of **Demand** under control is as specified by **NGET** and is not reduced unacceptably during equipment outage or maintenance conditions

CC.A.5.4 **LOW FREQUENCY RELAY TESTING**

CC.A.5.4.1 **Low Frequency Relays** installed and commissioned after 1<sup>st</sup> January 2007 shall be tested in accordance with and comply with the functional test requirements for **Frequency Protection** contained in Energy Networks Association Technical specification 48-6-5 Issue 1 dated 2005 “**ENA Protection Assessment Functional Test Requirements – Voltage and Frequency Protection**”.

For the avoidance of doubt, **Low Frequency Relays** installed and commissioned before 1<sup>st</sup> January 2007 shall comply with the version of CC.A.5.1.1 applicable at the time such **Low Frequency Relays** were commissioned.