



National Grid

GRID CODE CONSULTATION DOCUMENT

Proposed changes to Connection Conditions CC.6.3.3 in respect of operation at frequencies below 49.5Hz.

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

Consultation Ref	E/03
Issue	1.0
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Responses required by	11th July 2003
Prepared by	National Grid

DOCUMENT LOCATION

National Grid website:

http://www.nationalgridinfo.co.uk/grid_code/mn_consultation_papers.html

DISTRIBUTION

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

A. Introduction

1. National Grid Company plc ("National Grid"), in accordance with its obligations under paragraph 2 of Condition 7 of the Transmission Licence, believes that the time has come to review, in consultation with authorised electricity operators liable to be materially affected thereby, the Grid Code and its implementation in certain respects.
2. This review is concerned with Grid Code requirements for generating plant operation at system frequencies below 49.5 Hz. The proposed Grid Code changes arising from the review were developed by National Grid in discussion with interested parties sitting on the Grid Code CC.6.3.3 Working Group. The proposed changes to the Grid Code were discussed at the Grid Code Review Panel meeting held on 22nd May 2003. Panel members agreed that National Grid should issue a Consultation Paper.
3. Following receipt of comments from those authorised electricity operators which it has consulted by this Paper, National Grid intends, in accordance with paragraph 2 of Condition 7 of the Transmission Licence, to send to the Authority :-
 - (a) a report on the outcome of its review, including this consultation process;
 - (b) the proposed revisions to the Grid Code which National Grid (having regard to the outcome of such review) reasonably thinks fit for the achievement of the objectives of the Grid Code referred to in subparagraph (b) of paragraph 1 of Condition 7 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.
4. The report will also be made publicly available on National Grid's website.
5. The revisions to the Grid Code proposed by National Grid and sent to the Authority then 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.

B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS

6. Background

- 6.1 In April 2000, Ofgem received a request from a Generator for a derogation from the Grid Code paragraph CC.6.3.3, stating that the technical design of its new technology and more efficient CCGT plant rendered it unable to comply with the requirements of that paragraph at frequencies below 49.5Hz. Following an Ofgem consultation, Ofgem confirmed that they would request NGC to review the Grid Code with a view to establishing the system

requirements underlying CC.6.3.3 and incorporate only the minimum requirements in the Grid Code.

- 6.2 The review considered a range of possible alternatives to the current power/frequency slope characteristics required by CC.6.3.3. The alternatives considered were between the extremes of the existing slope requiring 95% of active power output at 47Hz, and a slope requiring 75% of active power output at 47Hz. The impact on frequency response and customer demand disconnection requirements were assessed.
- 6.3 As a result of this assessment, National Grid believes that relaxation of the existing CC.6.3.3 requirements below 49.5Hz would result in:
- A substantial and unjustifiable increase in system balancing cost due to an increase in the requirement for frequency response holding;
 - An increase in the amount of customer, and demand disconnection of 5% and 10%, and;
 - A risk of collapse of power islands which form under emergency system operating conditions.
- 6.4 However, since compliance with CC.6.3.3 involves the use of special actions (e.g. overfiring, water injection, or other measures) which cause the plant to operate beyond its rated design parameter(s), CCGT plant owners and manufacturers have stated the existence of a real risk of plant tripping for prolonged operation at frequencies below 49Hz. Manufacturers also stated that whilst the probability of tripping depends on the frequency itself, duration of operation and ambient conditions, this probability cannot be quantified analytically or empirically due to the absence of any operating experience at such low frequencies.
- 6.5 The minimum system security requirement is based on the minimum risk to the security of customer demand. National Grid believes this minimum risk is consistent with the need to reduce the risk of CCGT plant tripping under such low frequency conditions.

7. Proposed Changes

- 7.1 National Grid believes that the minimum system requirements can be met by adopting the following proposals.
- 7.2 It is proposed that the existing CC.6.3.3 requirements should be retained for frequencies down to the low frequency relay trip setting of the first stage of the automatic low frequency demand disconnection scheme of 48.8Hz.
- 7.3 For frequencies below the above setting where special action(s) are required to meet the existing requirements, it is proposed that the existing CC.6.3.3 requirements should be retained for a period of 5 minutes. Thereafter, a relaxation is proposed, and the special action(s) should be discontinued if there is a materially increased risk of the plant tripping. The need for special action(s) is linked to the inherent gas turbine active power output reduction caused by reduced shaft speed due to falling system frequency.

- 7.4 This relaxation may require control/time delay/mode switching functions to facilitate smooth transition between modes of operation. The implementation of such facilities must not introduce new unacceptable risks.
- 7.5 The proposed CC.6.3.3 text is given in Appendix 1. For all stakeholders (Generators, NGC, Distribution Network Operators and plant manufacturers) to obtain the benefits of this proposed relaxation, National Grid believes the proposals should be applied to all CCGT plant where there is a material increase in the risk of plant tripping during a prolonged period of operation below 48.8Hz.
- 7.6 For information the Working Group final report (paper GCRP 03/12) to the Grid Code Review Panel is available on the National Grid website:

http://www.nationalgridinfo.co.uk/grid_code/pdfs/pp03_12.pdf

http://www.nationalgridinfo.co.uk/grid_code/pdfs/pp03_12wgreport.pdf

C. COMMENTS

8. National Grid would be grateful to receive your comments on, or any suggestions you may have in relation to, these proposed amendments to the Grid Code. Comments would be welcomed and should be sent to National Grid by **11th July 2003**. The comments will be reviewed and responded to and National Grid will then prepare its report to the Authority.
9. Unless otherwise marked as confidential any responses containing objections to the proposals which are maintained will be published on our website in the copy of the Report to the Authority referred to in paragraphs 3 and 4.
9. Your formal responses may be:-

Posted to: David Payne
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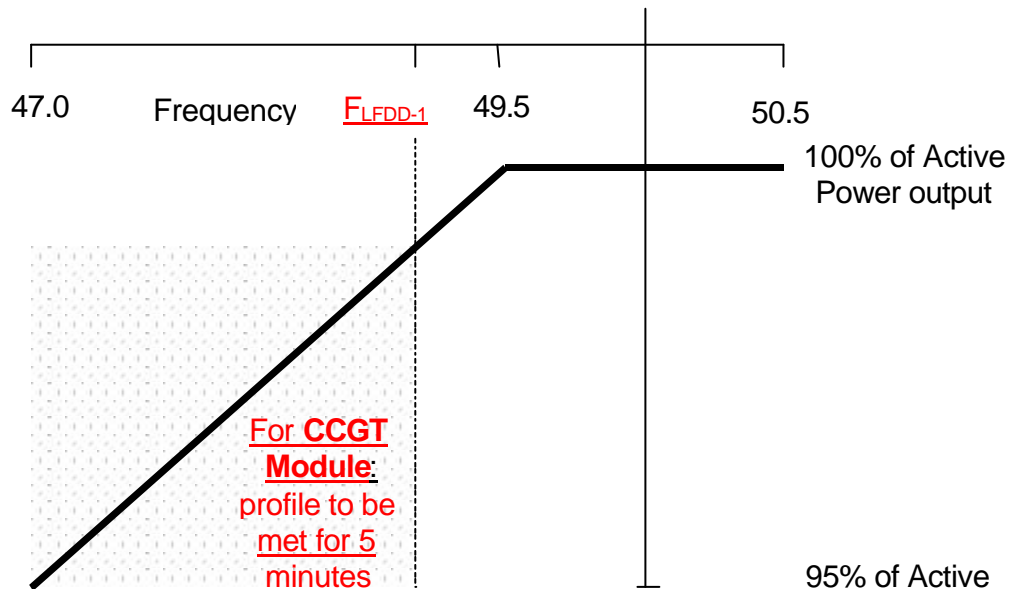
Faxed to: 024 7642 3298

Emailed to: david.payned@uk.ngrid.com

Appendix 1 – Extract from the Connection Conditions

- CC.6.3.3 Each **Generating Unit** and/or **CCGT Module** must be capable of
- (a) continuously maintaining constant **Active Power** output for **System Frequency** changes within the range 50.5 to 49.5 Hz; and
 - (b) maintaining its **Active Power** output at a level not lower than the figure determined by the linear relationship shown in Figure 1 for **System Frequency** changes within the range 49.5 to 47 Hz, such that if the **System Frequency** drops to 47 Hz the **Active Power** output does not decrease by more than 5%.

In the case of a CCGT Module, the above requirement shall be retained down to the Low Frequency Relay trip setting of 48.8 Hz, or such other setting notified by NGC to the User, which will reflect the first stage of the Automatic Low Frequency Demand Disconnection scheme notified to Network Operators under OC6.6.2. For System Frequency below that setting, the existing requirement shall be retained for a period of 5 minutes while it remains below that setting, and special action(s) that may be required to meet this requirement shall be kept in service during this period. At the end of that 5 minutes period, if System Frequency remains below that setting, the special action(s) must be discontinued if there is a materially increased risk of the Gas Turbine tripping. The need for special action(s) is linked to the inherent Gas Turbine Active Power output reduction caused by reduced shaft speed due to falling System Frequency.



Note: Frequency F_{LFDD-1} is the relay trip setting of the first stage of the Automatic Low Frequency Demand Disconnection Scheme

Figure 1