



A REPORT TO THE AUTHORITY
Pursuant to Paragraph 2 of Condition C14 of the
Transmission Licence

Grid Code Requirements for OC6.6 (Automatic LFDD)

**The purpose of this document is to assist the Authority in its
decision of whether to implement the proposed
Grid Code Modification**

Consultation Paper Ref	D/09
Issue	1.1
Date of Issue	18 th December 2009
Prepared by	National Grid

DISTRIBUTION

Name	Organisation
Authority	Ofgem
Grid Code Review Panel Members	Various
National Grid Industry Information Website	

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SUMMARY OF PROPOSALS

- 0.1 The proposed changes to the Grid Code, as outlined in this report, were developed by a Working Group of the Grid Code Review Panel (GCRP). The intention of the proposals is to provide clarity and consistency for all industry parties in respect of the operation of the Low Frequency Demand Disconnection scheme. The proposals were discussed at the GCRP meeting on 21st May 2009 and the Panel agreed that they should be taken to industry consultation.
- 0.2 National Grid has consulted Authorised Electricity Operators on this issue. All respondents were supportive of the proposals. Some text changes intended as clarifications were suggested and have been included. One other proposed change, relating to the use of a historic demand background, rather than a forecast background, has not been included as National Grid considers the use of forecast data to be the most consistent and robust approach.
- 0.3 National Grid recommends to the Authority that these proposals be approved.

A. INTRODUCTION

1. Paragraph 2 of Condition C14 of the Transmission Licence granted to 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 sustained.
2. This review examines proposed amendments to the existing Grid Code provisions relating to automatic low frequency demand disconnection schemes (LFDD) that are intended to clarify the requirements and ensure a consistent approach by the Distribution Network Operators (DNO). The proposals were developed through the joint Grid Code/ Distribution Code EC3 OC6.6 Working Group.
3. The proposed changes to the Grid Code were discussed with the Grid Code Review Panel (GCRP) on 21st May 2009. Panel Members agreed that National Grid should issue a Consultation Paper regarding the proposed changes.
4. National Grid, in accordance with its obligations under its Transmission Licence, consulted Authorised Electricity Operators by including Consultation Paper D/09 on the National Grid Industry Information website. This paper contained an explanation of the proposed amendments to the Grid Code and a copy is attached to this Report as Appendix B. National Grid informed interested parties that a copy of the Consultation Paper had been placed on its website to ensure its wide availability.
5. Comments were invited from all such Authorised Electricity Operators by 1st October 2009. National Grid received five responses from Authorised Electricity Operators.
6. The proposed revisions to the Grid Code are explained below.

B. DESCRIPTION OF THE AMENDMENTS PROPOSED IN THE CONSULTATION AND THEIR EFFECTS

7. Background

7.1 On 27th May 2008 an exceptional loss of generation led to the operation of the first stage of the national Low Frequency Demand Disconnection (LFDD) scheme. Though the LFDD scheme operated successfully and limited the frequency fall, there were a few isolated instances of ineffective operation of relays, and many relays did not operate. An investigation by the Energy Emergency Executive Committee (E3C) Task Group led to a recommendation that the Grid Code requirements of OC6.6 be reviewed to see if any improvement to the scheme could be made. The Grid Code Review Panel established the OC6.6 (Automatic LFDD) working group to undertake this review. The group comprised representatives of DNOs, National Grid, the AEP and OFGEM.

7.2 The rationale behind the proposals was developed through discussions in the Working Group. A link to the Working Group Report, which includes the group's Terms of Reference, is given below. The group considered issues, such as relay maintenance regimes, that are not within the scope of the Grid Code in addition to Grid Code requirements. This Report to the Authority only concerns the recommended Grid Code modifications. On 7th December 2009 National Grid wrote to all the DNOs, informing them of the non-code recommendations made by the Working Group and requested their implementation. The recommendations included the issue of a guidance note to internal staff relating to the LFDD scheme and the installation of a highly visible system frequency meter in each DNO control rooms.

https://www.nationalgrid.com/uk/Electricity/Codes/gridcode/workinggroups/E3C_Working_Group/

8. Working Group discussions

8.1 Grid Code clause OC6.6.1 specifies the percentage of demand that should be available for LFDD disconnection and the time on which this figure is based. It specifies a percentage at the time of the DNO's peak demand. This time varies between DNOs and the requirement may not result in the specified percentage demand being available for disconnection at the time of the National Electricity Transmission System peak demand, which is the intention of the requirement. It is therefore proposed to modify the requirement to specify the percentage of demand available for low frequency disconnection at the time of National Electricity Transmission System peak demand.

8.2 There is a lack of clarity as to whether the requirement should be based on the forecast or historic National Electricity Transmission System peak demand. Both interpretations have been made by DNOs in setting up their schemes. Discussions took place on the relative merits of both options. It was agreed that in practice no significant differences were expected. Some members supported using historic demand as a basis as this would not require the application of forecast demand growths, which may not be accurate, at BSP level. Some members preferred to leave the requirement unchanged, allowing DNOs to use historic demands as a basis but taking into account expected significant changes, such as network reconfiguration or the connection of large new loads. Others believe that it is preferable to include a clear requirement that forecast demand should be used to ensure consistency. It is NGET's view that the latter is preferable as the forecast

demand growths applied by DNOs to demands for the next winter will be sufficiently accurate and this option will ensure that any network changes are considered. The proposal is to change the requirements so that they specify that the scheme should be based on forecast demand.

- 8.3 Table 12a is a proforma drawn up by NGET for the purpose of Grid Code clause OC6.6.2 (d), which requires the annual submission of LFFD data by DNOs. This proforma does not explicitly indicate that the data required relates to a forecast time of National Electricity Transmission System peak demand. It is proposed to clarify this and incorporate the table in the Data Registration Code (DRC).
- 8.4 CC.A.5.1 in Appendix 5 of the Grid Code Connection Conditions specifies the functional requirements of the scheme relays. The stated operating time of 100ms – 150ms refers to the relay, not the demand disconnection time. This operating time is dependent on the rate of change of frequency as that affects the measurement time, and includes any time delay set by the user. As modern relays, for example MICOM P941 and ARGUS AR8, can have a typical operating time of less than 100ms it was agreed that a minimum operating time should not be specified and it is proposed to modify the clause accordingly.
- 8.5 The total time to disconnect demand includes the operation of the trip relay and circuit breakers. Modern 33kV circuit breakers have a typical operating time of 40-80 ms including arc extinction; older types having typically 80-100ms.
- 8.6 For the LFDD scheme to perform optimally, the total operating time, ie including breaker operation, should not be more than 200ms. In some cases, even with modern circuit breakers, 200ms may not be achievable (tests would be needed to assess this). The slower scheme operating times associated with existing, slower circuit breakers may require the operation of more scheme stages but they are not expected to prevent successful scheme operation. As low frequency events initiating LF relays are quite rare and sub-optimal operation will not prevent successful scheme operation, the group agreed that accelerated circuit breaker or other asset replacement cannot be justified on the grounds of slower operating time. The group agreed that the Grid Code requirement should reflect the aim to achieve a 200ms operating time whilst recognising that generally it would not be economically justifiable to replace assets to achieve this.
- 8.7 Table CC.A.5.5.1a specifies for each stage the percentage demand blocks and associated frequency settings. Some DNOs have expressed concern that as there is no tolerance in these settings, it is practically impossible to comply. It is proposed that the % demand blocks shall be qualified with “as far as reasonably practical” for each stage.

9. Proposed Grid Code Changes

9.1 The proposed Grid Code changes are to:

- modify OC6.6.1 to specify that the LFDD scheme should be based on forecast demand at the time of the National Electricity Transmission System peak demand.
- remove the minimum operating time requirement from CCA.5.1.1 (b)

- add a new clause CC.A.5.3.2 requiring that the total scheme operating time is less than 200ms where practicable (replacement of plant installed prior to October 2009 has been excluded)
- modify CC.A.5.5.1 in line with the changes to OC6.6.1. In the working group report this proposed change does not include that the basis should be forecast data. This was an error in a previous report.
- to clarify in CC.A.5.5.1 that the percentage figures should be achieved as far as reasonably practicable
- add schedule 12A to the DRC, indicating the format for the submission of LFDD scheme data.

9.2 The proposed amendments are shown in Appendix A.

9.3 The proposed solution will:

- § Clarify the arrangements for the Low Frequency Demand Disconnection scheme, ensuring its robustness.

10. Impact on National Electricity Transmission System

10.1 The proposed changes will not have any adverse impact on the National Electricity Transmission System.

11. Impact on Grid Code Users

11.1 The proposals will provide additional clarity to Users and ensure consistency in interpretation of the requirements.

12. Assessment Against Grid Code Objectives

12.1 The proposed changes outlined in D/09 Report to the Authority will better facilitate Grid Code Objectives:

- iii) to promote the security and efficiency of the electricity generation, transmission and distribution system in Great Britain

by improving the clarity of the requirements from the Low Frequency Demand Disconnection Scheme.

13. Impact on Industry Documents

Impact on Core Industry Documents

- 13.1 Grid Code Report to the Authority D/09 has no impact upon Core Industry Documents.

Impact on other Industry Documents

- 13.2 Grid Code Report to the Authority D/09 has no impact upon other Industry Documents.

14. Environmental Impact Assessment

- 14.1 Grid Code Report to the Authority D/09 is anticipated to have a zero environmental impact.

C. CONSULTATION RESPONSES

15. National Grid has consulted Authorised Electricity Operators on this issue. Five responses were received. All four respondents who stated an opinion, gave their support for the proposals. All responses, along with National Grid's replies, are included as Appendix C.
16. Respondent D/09-CR-01 (CE Electric UK) was generally supportive of the proposals as they clarify some of the ambiguities relating to the LFDD scheme. An area of discussion raised was whether LFDD schemes should seek to disconnect 60% of historic or forecast transmission system peak demand. The respondent stated that the proposed approach, which uses forecast data requires additional analyses by the DNOs and introduces additional uncertainty and error. Whilst National Grid notes such a proposal, it believes the use of forecast data ensures consistency across all DNOs and ensures robustness of the LFDD scheme and therefore has not revised the proposals in this area.
17. One respondent D/09-CR-02 (ENW) suggested that there should be a specific exclusion for retrospective application of the new requirement for a 200 millisecond operating time for the Low Frequency Demand Disconnection scheme. National Grid responded that although it does not foresee such a requirement becoming an absolute requirement in the future, the clause could be clarified to ensure it fully represents the group view that it is not justifiable to replace existing plant to meet the requirement. Consequently, the final proposals contain an additional sentence within CC.A.5.3.2 excluding the replacement of plant installed prior to October 2009.
18. The same respondent also suggested two clarifications to the Consultation document relating to the use of acronyms and a typographical error. As the Consultation document has fulfilled its purpose and will not be reissued, National Grid will taken such comments on board for subsequent publications but will not be reissuing the original Consultation.
19. Respondent D/09-CR-05 (Magnox) was supportive of the changes. Magnox raised the question of whether an LFDD scheme that is set to disconnect a specific proportion of demand at Winter Peak Demand would have the same characteristics at other times, such as weekends or during the night. National Grid responded that the Working Group's work included an historic assessment at how each DNO's LFDD's schemes would have performed at five specified times and dates in 2008, to cover a range of system conditions. The findings were that variation in performance was small and did not justify modifying the scheme principles in the Grid Code.

D. LEGAL TEXT AND RECOMMENDATIONS

20. Connection Conditions

20.1 It is proposed to amend the existing clause CC Appendix 5 to clarify that:

- remove the minimum operating time requirement from - CCA.5.1.1 (b)
- add a new clause requiring that the total scheme operating time is less than 200ms where practicable, clarifying that replacement of existing assets is not needed - CC.A.5.3.2
- modify CC.A.5.5.1 in line with the changes to OC6.6.1. In the working group report this proposed change does not include that the basis should be forecast data (this was an error in the report).
- to clarify that the percentage figures should be achieved as far as reasonably practicable - CC.A.5.5.1

21. Operating Code 6

22. It is proposed to modify OC6.6.1 to specify that the LFDD scheme should be based on forecast demand at the time of the National Electricity Transmission System peak demand.

23. Data Registration Code

24. Add schedule 12A to the DRC, indicating the format for the submission of LFDD scheme data.

25. Recommendation

26. National Grid recommends to the Authority that these proposals be approved such that there is greater clarity and consistency for all industry parties in respect of the operation of the Low Frequency Demand Disconnection scheme.

27. The proposed Grid Code changes are shown in Appendix A with deletions shown struck through and insertions highlighted by text in red with a double underline.

28. As indicated above, having regard to the outcome of the review described in this Report, National Grid proposes the revisions to the Grid Code set out in Appendix A, which revisions we reasonably think fit for the achievement of the objectives referred to in sub-paragraph (b) of paragraph 1 of Condition C14 of the Transmission Licence. In view of this, National Grid would be grateful if the Authority would approve the revisions pursuant to paragraph 3 of Condition C14 of the Transmission Licence.

29. Given the logistic exercise of organising replacement pages to reflect the changes required by your letter of approval, I would be grateful if you would contact me prior to issuing any letter specifying an effective date in order to ensure that the date is consistent with any other Code changes which may then be approved or be close to being approved.

Tom Ireland