nationalgrid

A REPORT TO THE AUTHORITY

Pursuant to Paragraph 2 of Condition C14 of the Transmission Licence

Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

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	A/09
Issue	1.0
Date of Issue	27th March 2009
Prepared by	National Grid

DISTRIBUTION

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

CONTENTS

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 Synchronous Generating Units above their Rated MW, taking account of the economic and environmental benefits of such operation, whilst ensuring that the Transmission System can be operated securely according to NGET's licensed standards. The proposals were discussed at the GCRP meeting on February 5th 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. Other proposed changes, also suggested for clarification and not affecting the principles of the proposal, have not been included as National Grid considers them sufficiently significant to require wider industry consideration.

0.3 The proposals will ensure that all generators are able to utilise efficiency improvements made to their plant during refurbishments, resulting in both economic and environmental benefits for the industry, whilst ensuring system security is maintained without additional infrastructure investment. They will maintain existing arrangements for Synchronous Generating Units already operating above Rated MW and apply consistent arrangements to generators intending to do so in the future, ensuring non-discrimination between generators and minimising the complexity of Transmission System operation.

0.4 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 clarifications to the Grid Code regarding the appropriate technical obligations for Synchronous Generating Units who operate above their Rated MW level. The proposals were developed through the Grid Code Rated MW Working Group.

3. The proposed changes to the Grid Code were discussed with the Grid Code Review Panel (GCRP) on 5th February 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 A/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 16th March 2009. National Grid received six responses from Authorised Electricity Operators.

6. The proposed revisions to the Grid Code are explained below.

B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS

7. Background

7.1 Reactive power capability requirements for Synchronous Generating Units are set out within CC.6.3.2 of the Grid Code. The provisions specify that when a Synchronous Generating Unit is operating at its original designed output (Rated MW) it must be capable of supplying Reactive Power in the range between 0.85 Power Factor Lagging (Export) and 0.95 Power Factor Leading (Import).

7.2 The provisions do not specify the reactive capability requirements at active power levels other than Rated MW. They assume that a Synchronous Generating Unit's capability will be determined by its performance chart. When the obligations were incorporated into the Grid Code it was not necessarily envisaged that Generating Units would operate above Rated MW.

7.3 The Grid Code provisions are utilised to plan and operate the GB Transmission System in accordance with National Grid's licence conditions[1]. Any deviations from the capabilities assumed in planning studies could have detrimental implications for the GB Transmission System in the form of losing local voltage support and reducing the transient, dynamic and voltage stability margins. This could lead to an increase in infrastructure and operational costs which will affect all system users.

7.4 Ongoing improvements in the efficiency of turbine blades means that generators are able to extract more mechanical power, and consequently supply more active electrical power, from the same amount of fuel without making changes to the boiler/gas burner or the electrical generator. When more efficient blades are fitted as part of a unit's refurbishment this results in the ability to operate above the Rated MW level for the unit. This operation at higher efficiency has both economic and environmental benefits associated with producing electrical energy from less fuel.

7.5 In some cases the potential operation of Synchronous Generating Units above their Rated MW has been brought to the attention of National Grid via the CUSC modification process as it has close interaction with a formal request to increase the Power Station's Transmission Entry Capacity (TEC)/Connection Entry Capacity (CEC) (Unit) allocation. These instances have been managed on an individual basis via amendments to the Power Station's Bilateral Agreement. The conditions specified in the Bilateral Agreement have been site specific and reflective of the local system constraints and operational conditions relevant to that individual Generator at its point of connection i.e. there have been no generic provisions.

7.6 It has been acknowledged by National Grid and generators that the current ad-hoc arrangements for managing the technical implications of Synchronous Generating Units exceeding their Rated MW do not provide the level of transparency regarding the associated technical obligations currently expected by Users, and increase complexity in operating the Transmission System. A Grid Code Working Group was established in June 2007 to discuss the issue and make any appropriate proposals to modify the Grid Code.

[1] SHETL and SPT have a similar licence obligation regarding planning of their Transmission System.

8. Working Group discussions

8.1 The Working Group initially considered the impact on the Transmission System of increasing amounts of generation operating above Rated MW with a corresponding reduction in reactive power capability. Analysis work concluded that significant investment in Transmission System infrastructure would be needed should existing generation with the potential to operate above Rated MW following refurbishment do so.

8.2 The group noted that system investment requirements are determined under the most onerous credible conditions and that for most operating conditions the operation of generating units above Rated MW may not be detrimental to system security. The times at which the full reactive capability is required from a particular generating unit are dependent on a number of factors including demand, the proximity of other generators and system outages.

8.3 A number of options were considered. They are described in the Working Group report (*http://www.nationalgrid.com/NR/rdonlyres/A1EA1918-7306-486D-9D8F-C9AAED9B399B/31709/pp09_08_ratemwwg.pdf*) and can be summarised as:

- allow generating units to operate above Rated MW all of the time with a reactive power capability greater than that given by the performance chart but less than the Grid Code requirement at Rated MW – described as the top hat approach;

- allow generating units to operate above Rated MW all of the time providing they can operate at 0.85 power factor lagging for a specified limited period of time – described as the transient approach;

- allow generators to operate above Rated MW according to their performance chart capability when this is sufficient for system security, but not when National Grid identify a system need for the capability at Rated MW.

8.4 The first option would require Transmission System re-inforcement in comparison with a system for which all generating units operated at Rated MW. Without testing of the units generators would not know the capability of their units beyond their performance charts. The group agreed not to pursue this option.

8.5 For the second option National Grid stated that a transient capability of 0.85 lagging power factor would be required for at least an hour to allow for operator action to secure the Transmission System following an incident. Testing of generating units is necessary to establish their capability. Generators were doubtful that their units would meet the requirement and so this option was not pursued further.

8.6 The third option was agreed and recommended by the group and is described below.

9. Proposed Grid Code Changes

9.1 The Working Group Members agreed, given the pending review of appropriateness of the existing technical performance obligations for reactive power by a different Working Group that discussion should focus on identification of an interim solution which would address concerns regarding the existing provisions. The proposed solution (as identified and agreed by the Working Group) is as follows:

9.1.1 For existing units that have conditions specified in their Bilateral Agreement relating to their reactive power capability at outputs above Rated MW, the existing arrangements will be preserved and the Grid Code will specify that for such units the Bilateral Agreement may specify the reactive capability requirements.

9.1.2 For existing units that operate above Rated MW (ie. they have a CEC greater than Rated MW) but have no relevant provisions in the Bilateral Agreement, the existing arrangements will continue and the Grid Code requirements will be unchanged.

9.1.3 For new connections, and for existing power stations that request a formal increase in their CEC, above Rated MW, the Grid Code will specify the following additional technical requirements:

- the Generating Unit must be capable of continuous operation at least 0.9 p.f. lagging;
- the leading power factor capability will be based on the under excitation limiter characteristic;
- National Grid will be able to request that a Generating Unit submits a Physical Notification (PN) no higher than its Rated MW at no cost should it see a system need (providing the unit has a reduced reactive power capability at the higher output level). The request will be made as soon as National Grid determine there is a system need and will be at least 1 hour prior to gate closure.

9.1.4 It is also proposed to clarify that when operating at output levels other than Rated MW, Synchronous Generating Units should operate to the generator performance chart of the unit.

9.1.5 The proposals will meet the objectives of allowing Generating Units to operate above Rated MW whenever possible without reducing system security or requiring Transmission System investment. The proposal will ensure greater consistency and clarity of the requirements for Generating Units.

9.1.6 The proposal includes a mechanism for enabling National Grid to instruct a Synchronous Generating Unit to resubmit their PN when there is a system need, as long as this instruction is received at least 1 hour prior to gate closure. A Transmission Related Agreement (TRA) will sit alongside the Bilateral Agreement to allow National Grid to recoup BOA (Bid Offer Acceptance) costs where these have been incurred as a result of a generator failing to resubmit its PN. Group members expressed concerns about the principles of TRAs. However, the Working Group noted that the TRA is an existing mechanism intended for use as in this proposal, and consideration of its principles is outside the scope of the group.

9.2 The proposed solution will:

- alleviate National Grid's concerns regarding system security;
- enable generators to operate above Rated MW as often as possible;
- apply consistent, visible operating conditions to all generators.

10. Impact on GB Transmission System

10.1 The proposal will ensure that use can be made of more efficient technologies being developed for generating plant, with both cost and environmental benefits, without incurring additional system investment costs or reducing the security of the GB Transmission System.

11. Impact on Grid Code Users

11.1 The Grid Code is currently silent regarding Synchronous Generating Units' Mvar output requirements at operating levels above and below Rated MW. The proposal will provide clarity to the Grid Code community regarding the associated technical obligations for Synchronous Generating Units' operating above or below their Rated MW.

11.2 The additional technical obligations for new connections (or existing power stations requesting an increase in their unit CEC) will provide clarity to the Grid Code community and provide certainty to allow investment decisions to be made.

11.3 The existing obligations for Non Synchronous Generating Units are not impacted by this proposal and therefore not subject to any proposed amendment(s).

12. Assessment Against Grid Code Objectives

12.1 The proposed changes outlined in A/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 allowing Generators to utilise efficiency improvements and ensuring that the Grid Code provides additional clarity and consistency to Users.

13. Impact on Industry Documents

13.1 *Impact on Core Industry Documents*

13.1.1 Grid Code Report to the Authority A/09 has no impact upon Core Industry Documents.

13.2 *Impact on other Industry Documents*

13.2.1 Grid Code Report to the Authority A/09 has no impact upon other Industry Documents.

14. Environmental Impact Assessment

14.1 Grid Code Report to the Authority A/09 will have a beneficial environmental impact as it will allow generators to utilise efficiency improvements to generate more active power from the same quantity of fuel.

C. CONSULTATION RESPONSES

15. National Grid has consulted Authorised Electricity Operators on this issue. Six responses were received. All respondents were supportive of the proposal. These responses, along with National Grid's replies, are included as Appendix C.

16. Two respondents (E.ON UK and RWE Group) suggested wording changes for clarification. Two of RWE's three comments have been included, as has one of E.ON's two. One comment from each has not been included.

17. Respondent A/09-CR-01 (British Energy – part of EDF Energy) was generally supportive of the changes. British Energy requested clarification on the duration of the proposals, which are intended as an interim arrangement. National Grid indicated that it is anticipated that a joint Grid Code/Balancing Services Standing Group (BSSG – CUSC) Working Group will be established later this year to consider all aspects relating to reactive power, such as the Grid Code requirements and reactive market arrangements. National Grid indicated that it is likely that this group will recommend Grid Code changes in respect of reactive power capability requirements.

18. Respondent A/09-CR-02 (E.ON UK) was supportive of the proposed changes. In their response E.ON UK suggested some minor improvements which could be made to the proposed legal text.

19. E.ON UK noted that CEC is measured at HV side of the generator transformer whilst Rated MW was measured at the LV side of the generator transformer and highlighted the potential for confusion. E.ON UK suggested that in order avoid such confusion, it would be important to stipulate at the 'Synchronous Generating Unit terminals' every time 'Power Factor' is mentioned. National Grid agrees that it is important to clarify that the Reactive Capability requirement is at the generating unit terminals. Grid Code provision CC.6.3.2 (a)(i) has been modified accordingly. National Grid believes this to be the only instance where the proposed text does not specify the unit terminals.

20. E.ON UK commented on the use of the word "limits", particularly that it may be interpreted as restricting a unit's output. "Limits" is used in the existing wording of CC.6.3.2 and is interpreted in the general context that the Grid Code specifies minimum requirements. The text of OC2.4.2.1 describes the requirement of the performance chart, stating that it should show any limits on performance. The proposed wording that a generating unit should operate to the limits shown on the performance chart is consistent with this.

21. Although National Grid has not incorporated the suggestion in the proposed text, it believes that it should be considered further in the Reactive Power Working Group that is expected to be established later this year.

22. Respondent A/09-CR-03 (Magnox North Ltd) indicated that the proposed changes have no material effect on Magnox power stations, as they are not able to operate above Rated MW. Therefore Magnox North had no strong view on the proposals. However the respondent did indicate that the proposed changes seems a sensible compromise between one extreme of preventing generators from ever operating above Rated MW, and the other extreme of allowing a free-for-all where Rated MW effectively has no meaning.

23. Respondent A/09-CR-04 (RWE Group) was generally supportive of the changes. In their reply RWE made three comments on the proposed legal text.

24. RWE suggested the example performance chart in OC2 be modified to show operation above Rated MW. National Grid agrees that there is benefit in this suggestion but believes that this change would be significant as additional limits would need including and the text of OC2 may need revision. Any changes may affect all performance chart submissions and National Grid's view is that they should therefore be considered by the industry prior to inclusion. Although National Grid has not incorporated this suggestion in the proposed text it believes that it should be considered further in the Reactive Power Working Group that is expected to be established later this year.

25. National Grid agreed with RWE's suggestions regarding the proposed amendments to CC.6.3.2 (a) (ii) (aimed at clarifying that for a CCGT module the CEC may relate to the combined output of a number of units) and noted that this clarification would provide greater transparency regarding the intention of the provision. National Grid will make the proposed amendments to the legal text that has been consulted upon. A similar modification has been made to the text of CC.6.3.2 (a) (i), BC1.8.1(i) and BC1.8.1 (iii).

26. RWE suggested alternative wording for BC.1.8.1 (iv) such that it provides additional clarification to Users regarding the intent of the provision. National Grid agrees with the proposed changes and will make the proposed amendments to the legal text that has been consulted upon.

27. Respondent A/09-CR-05 (SAIC on behalf of Scottish Power Energy Wholesale) was supportive of the proposed changes as they would allow plant, where improvements have been made, to continue operating under their current arrangements, while providing an avenue for new or existing plant to carry out any required upgrade work.

28. Respondent A/09-CR-06 (SSE Generation) was supportive of the proposed changes outlined by Grid Code Consultation A/09.

D. LEGAL TEXT AND RECOMMENDATIONS

29. Connection Conditions

29.1 It is proposed to amend the existing clause CC.6.3.2(a) to clarify that:

- All generating units must be capable of continuous operation at all points included within the limits shown on the submitted performance chart.
- New units and those seeking to increase their CEC in the future must be capable of operating to at least 0.9 power factor lagging and are subject to the new clause BC1.8.
- For existing units with conditions specified in their Bilateral Agreements relating to operation above Rated MW, these conditions will be retained.

29.2 It is proposed to modify CC.A.6.2.7.1. This clause defines the characteristic of the Under Excitation Limiter from no-load to rated load. The characteristic determines the leading power factor capability of the unit. It is proposed to extrapolate the current requirement between rated load and the maximum output of the unit.

30. Balancing Code 1

30.1 It is proposed to add a new clause to BC1 that will allow National Grid to request a generator to restrict the output of a unit, and submit an appropriate Physical Notification, to Rated MW to ensure that the unit is capable of operating continuously anywhere between 0.9 power factor leading and 0.85 power factor lagging, the capability assumed during system design work. National Grid may issue such requests in respect of units completed or increasing their CEC after 1st May 2009.

31. Recommendation

31.1 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 Synchronous Generating Units above their Rated MW, taking account of the economic and environmental benefits of such operation, whilst ensuring that the Transmission System can be operated securely according to NGET's licensed standards.

32. 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. Changes to the legal text which was consulted upon are highlighted in yellow.

33. 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.

34. 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.

Lilian Macleod

APPENDIX A: PROPOSED GRID CODE CHANGES

The proposed legal text is reflective of the current Grid Code baseline as specified in Issue 3 Revision 33

Proposed Changes to Connection Conditions

Amend CC.6.3.2 (a) and CC.A.6.2.7.1 as follows:

CC.6.3.2 (a) When supplying **Rated MW**, ~~All~~ all **Synchronous Generating Units** must be capable of ~~supplying **Rated MW**~~ continuous operation at any point between the limits 0.85 **Power Factor** lagging and 0.95 **Power Factor** leading at **the Synchronous Generating Unit** terminals. At **Active Power** output levels other than **Rated MW**, all **Synchronous Generating Units** must be capable of continuous operation at any point between the **Reactive Power** capability limits identified on the **Generator Performance Chart**.

In addition to the above paragraph, where **Synchronous Generating Unit(s)**

(i) have a **CEC** which has been increased above **Rated MW** (or the **CEC** of the **CCGT module** has increased above the sum of **Rated MW** of the **Generating Units** comprising the **CCGT module**), and such increase takes effect on or after 1st May 2009, or have a **Completion Date** on or after 1st May 2009, the minimum lagging **Reactive Power** capability at the terminals of such **Synchronous Generating Unit(s)** must be 0.9 **Power Factor** at all **Active Power** output levels in excess of **Rated MW**. Further, the **User** shall comply with the provisions of and any instructions given pursuant to BC1.8 and the relevant **Bilateral Agreement**; or

(ii) have a **CEC** in excess of **Rated MW** (or the **CEC** of the **CCGT module** exceeds the sum of **Rated MW** of the **Generating Units** comprising the **CCGT module**) and a **Completion Date** before 1st May 2009, alternative provisions relating to **Reactive Power** capability may be specified in the **Bilateral Agreement**, and where this is the case such provisions must be complied with.

The short circuit ratio of **Synchronous Generating Units** shall be not less than 0.5.

CC.A.6.2.7.1 The security of the power system shall also be safeguarded by means of MVAr **Under Excitation Limiters** fitted to the generator **Excitation System**. The **Under Excitation Limiter** shall prevent the **Automatic Voltage Regulator** reducing the generator excitation to a level which would endanger synchronous stability. The **Under Excitation Limiter** shall operate when the excitation system is providing automatic control. The **Under Excitation Limiter** shall respond to changes in the **Active Power** (MW) and the **Reactive Power** (MVAr), and to the square of the generator voltage in such a direction that an increase in voltage will permit an increase in leading MVAr. The characteristic of the **Under Excitation Limiter** shall be substantially linear from no-load to ~~rated load~~ the maximum **Active Power** output of the **Generating Unit** at any setting and shall be readily adjustable.

Proposed Changes to Balancing Code 1 (Pre Gate Closure Process)

Insert new clause.

BC1.8 Provision of **Reactive Power** capability

BC1.8.1 Under certain operating conditions **NGET** may identify through its **Operational Planning** that an area of the **GB Transmission System** may have insufficient **Reactive Power** capability available to ensure that the operating voltage can be maintained in accordance with **NGET's** licence standards.

In respect of **Synchronous Generating Unit(s)**

(i) that have a **CEC** in excess of **Rated MW** (or the **CEC** of the **CCGT module** exceeds the sum of **Rated MW** of the **Generating Units** comprising the **CCGT module**); and

(ii) that are not capable of continuous operation at any point between the limits 0.85 **Power Factor** lagging and 0.95 **Power Factor** leading at the **Synchronous Generating Unit** terminals at **Active Power** output levels higher than **Rated MW**; and

(iii) that have either a **Completion Date** on or after 1st May 2009, or where its **CEC** has been increased above **Rated MW** (or the **CEC** of the **CCGT module** has increased above the sum of **Rated MW** of the **Generating Units** comprising the **CCGT module**) such increase takes effect on or after 1st May 2009; and

(iv) that are in an area of potentially insufficient **Reactive Power** capability as described in this clause BC1.8.1 ~~deficiency~~.

NGET may instruct the **Synchronous Generating Unit(s)** to limit its submitted **Physical Notifications** to no higher than **Rated MW** for a period specified by **NGET**. Such an instruction must be made at least 1 hour prior to **Gate Closure**, although **NGET** will endeavour to give as much notice as possible. The instruction may require that a **Physical Notification** is re-submitted. The period covered by the instruction will not exceed the expected period for which the potential deficiency has been identified. Compliance with the instruction will not incur costs to **NGET** in the **Balancing Mechanism**. The detailed provisions relating to such instructions will normally be set out in the relevant **Bilateral Agreement.**

APPENDIX B: CONSULTATION PAPER A/09

nationalgrid

GRID CODE

CONSULTATION DOCUMENT

Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

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/09
Issue	1.0
Date of Issue	16th February 2009
Responses required by	**16th March 2009**
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	

CONTENTS

SUMMARY OF PROPOSALS

0.1 Reactive power capability requirements for Synchronous Generating Units are set out within CC.6.3.2 of the Grid Code. The provisions specify that when a Synchronous Generating Unit is operating at its original designed output (Rated MW) it must be capable of supplying Reactive Power in the range between 0.85 Power Factor Lagging (Export) and 0.95 Power Factor Leading (Import).

0.2 Ongoing improvements in the efficiency of turbine blades means that generators are able to extract more mechanical power, and consequently supply more active electrical power, from the same amount of fuel without making changes to the boiler/gas burner or the electrical generator. When more efficient blades are fitted as part of a unit's refurbishment, this results in the ability to operate above the Rated MW level for the unit.

0.3 Such operation is beneficial both financially and environmentally as more energy is produced from the same amount of fuel. However, at operating levels above Rated MW the Reactive Power capability of the unit is reduced. National Grid has expressed concerns regarding the potential implications for the GB Transmission System (in both planning and operational timescales) of Synchronous Generating Units exceeding their Rated MW and consequently reducing the reactive power capability available to the system. When written, the existing Grid Code provisions did not necessarily envisage Synchronous Generating Units operating, for any substantial length of time, above their Rated MW.

0.4 Currently, a Generating Unit may operate above Rated MW providing this would be within the Performance Chart, Unit Connection Entry Capacity (CEC), Registered Capacity, Maximum Export Limit (MEL) and Physical Notification (PN). Where a Generator has requested an increase in CEC above Rated MW, such that National Grid becomes specifically aware of potential operation above Rated MW, conditions have been included in the Bilateral Agreement to ensure that system security can be maintained without excessive operational costs. In circumstances where National Grid is not aware of such operation any system impact cannot be taken into account.

0.5 The proposal is an interim measure that will:

- allow new generators and those subject to CEC increases to operate above Rated MW whenever possible, but require them to reduce their output when this is required for Transmission System security;
- preserve the arrangements for existing generators
- not result in additional transmission investment or operational costs;
- not require additional investment by generators.

0.6 A separate Grid Code Working Group will be tasked with considering the wider issue of the provision of reactive power by all types of generators across the whole of their operating range.

0.7 The existing provision relating to Non Synchronous Generating Units have been deemed to be still appropriate and valid for this type of plant and therefore the proposed Grid Code amendment is not appliable to this type of plant.

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 examines proposed clarification to the Grid Code regarding the appropriate technical obligations for Synchronous Generating Units who operate above their Rated MW level. The proposals were developed through the Grid Code Rated MW Working Group.

3. The proposed changes to the Grid Code were discussed with the Grid Code Review Panel (GCRP) on 5th February 2009. Panel Members agreed that National Grid should issue a Consultation Paper regarding the proposed changes.

4. Comments upon the proposed changes within this consultation should be sent to National Grid by **16th March 2009** as detailed in section C. The comments will be reviewed and responded to.

5. Following this consultation, National Grid will prepare a Report to the Authority detailing National Grid's recommended changes to the Grid Code and all comments/responses received from Authorised Electricity Operators through this consultation. Once sent to the Authority this report will be made available on National Grid's website.

6. Where Authorised Electricity Operators' responses have been marked as confidential they will not be published within the version of the Report to the Authority placed on the National Grid website.

7. 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.

B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS

8. Background

8.1 Reactive power capability requirements for Synchronous Generating Units are set out within CC.6.3.2 of the Grid Code. The provisions specify that when a Synchronous Generating Unit is operating at its original designed output (Rated MW) it must be capable of supplying Reactive Power in the range between 0.85 Power Factor Lagging (Export) and 0.95 Power Factor Leading (Import).

8.2 The provisions do not specify the reactive capability requirements at active power levels other than Rated MW. They assume that a Synchronous Generating Unit's capability will be determined by its performance chart. When the obligations were incorporated into the Grid Code it was not envisaged that Generating Units would operate above Rated MW for any substantial length of time.

8.3 The Grid Code provisions are utilised to plan and operate the GB Transmission System in accordance with National Grid's licence conditions[2]. Any deviations from the capabilities assumed in planning studies could have detrimental implications for the GB Transmission System in the form of losing local voltage support and reducing the transient, dynamic and voltage stability margins. This could lead to an increase in infrastructure and operational costs which will affect all system users.

8.4 Ongoing improvements in the efficiency of turbine blades means that generators are able to extract more mechanical power, and consequently supply more active electrical power, from the same amount of fuel without making changes to the boiler/gas burner or the electrical generator. When more efficient blades are fitted as part of a unit's refurbishment this results in the ability to operate above the Rated MW level for the unit. This operation at higher efficiency has both economic and environmental benefits associated with producing electrical energy from less fuel.

8.5 In some cases the potential operation of Synchronous Generating Units above their Rated MW has been brought to the attention of National Grid via the CUSC modification process as it has close interaction with a formal request to increase the Power Station's TEC/CEC (Unit) allocation. These instances have been managed on an individual basis via amendments to the Power Station's Bilateral Agreement. The conditions specified in the Bilateral Agreement have been site specific and reflective of the local system constraints and operational conditions relevant to that individual Generator at its point of connection i.e. there have been no generic provisions.

8.6 It has been acknowledged by National Grid and generators that the current ad-hoc arrangements for managing the technical implications of Synchronous Generating Units exceeding their Rated MW do not provide the level of transparency regarding the associated technical obligations currently expected by Users, and increase complexity in operating the Transmission System.

[2] SHETL and SPT have a similar licence obligation regarding planning of their Transmission System.

9. Working Group Discussions

9.1 The rationale behind the proposals was developed through discussions in the Grid Code Rated MW Working Group. The Working Group Terms of Reference and the complete record of how the change proposals were developed can be found in the Working Group Report:

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

9.2 The Generating Units exceeding their Rated MW Working Group was established and tasked with discussing and reviewing the technical issues raised by Synchronous Generating Units operating above their Rated MW level, and proposing a technical solution to the matter.

9.3 Reactive power (MVAr) is required to operate a power system and is associated with the control of voltage. The provision of reactive power to support voltages is a localised issue, as transmission of reactive power degrades much more quickly than MW over distance. Therefore the utilisation (and associated capability) of reactive power on the GB Transmission System can be extremely critical in some geographical areas.

9.4 Synchronous Generating Units could, if permitted, operate above Rated MW up to a level which is determined by the physical constraints of the unit. The design of the GB Transmission System was based upon operation at Rated MW and that operation above this baseline would have an impact on National Grid. National Grid has obligations to design and maintain a secure, efficient and economic system, within the terms of the Grid Code and the GB Security and Quality of Supply Standards (GBSQSS). Synchronous Generating Units exceeding their Rated MW may result in additional investment being required on the GB Transmission System, mainly as reactive compensation to make up the shortfall no longer available from generators operating above their Rated MW.

9.5 It was agreed that it was important to gauge the scale and consequential impact on the GB Transmission System of any operation at levels above Rated MW. Historically the assumption was that Synchronous Generating Units could not exceed their Rated MW for any significant length of time although this was not always the case. If further Synchronous Generating Units now began operating differently it may require National Grid (and other Transmission Owners where applicable) to design, operate and maintain the system in a different way.

9.6 Quantifying the Issue

9.6.1 At present it is mostly pre-vesting plant which has the greatest potential for operating above their Rated MW as it is most likely to be undergoing refurbishment. It was noted that all types of plant had the potential for operating above their Rated MW following refurbishment. Advice received indicated that it was technically feasible for Synchronous Generating Units to operate between 5% and 10% above their Rated MW following turbine blade replacement. The cumulative effect of a sizable portion of the generation fleet exceeding their Rated MW by this amount would have a material impact on the GB Transmission System in terms of the provision of Reactive Power on the system.

9.6.2 Analysis completed by National Grid attempted to quantify the cumulative effects, across one GB Transmission System boundary with well known reactive

capability requirements. The analysis was based on all pre-vesting coal-fired plant operating at 5% and 10% above their Rated MW with a reduced reactive power capability in line with unit's MVA rating.

9.6.3 The analysis found that should all the pre-vesting Generators operate 5% above their Rated MW it would necessitate the installation of an additional 5 Mechanically Switched Capacitors (MSCs) at a cost of £30m. Should the Generators operate 10% above their Rated MW it would necessitate an additional 20+ MSCs at a cost of £150m, and thermal reinforcement work to accommodate the increased transfers of £80m giving a total investment cost of £230m.

9.6.4 The study assumed that the increase in MW would result in other Generating Units being taken off. It was acknowledged that by pulling back the non pre-vesting generation to keep the system in balance, as opposed to taking units off, the overall impact of those units operating above Rated MW on this boundary would be less. However, it was thought unlikely that there would be large numbers of units operating at part load. It was noted that an increased output from some Synchronous Generating Units may displace other plant which may not be able to operate above their Rated MW.

9.6.5 The study undertaken did not consier any issues regarding stability, which may require dynamic Static VAR Compensator's (SVC) which are significantly more expensive than MSCs. The additional investment, on the GB Transmission System identified by the study did not form part of current allowed capital expenditure, as agreed under the current Price Control Reviews.

9.6.6 It was agreed that further, more detailed, analysis of the costs was not necessary, as it was acknowledged that assessment of the benefits of generation operating above Rated MW for comparison with the costs of managing/operating the system is very difficult; requiring prediction of the effects on market MW prices.

9.6.7 The ability of National Grid to pull back Synchronous Generating Units to their Rated MW level within gate closure was discussed. National Grid informed the group that it would be difficult to analyse, process and inform the relevant Power Station of the necessary instruction within gate closure, more time would be required especially if there were a number of Power Stations operating above Rated MW.

9.7 Potential Solutions

9.7.1 The Working Group discussed various solutions which would address both National Grid's and User's requirements regarding Synchronous Generating Units exceeding their Rated MW. Each potential solution was discussed, the debate focusing on the technical, planning and operational practicalities of the particular solution.

Site Specific Criteria

9.7.2 This is the current arrangement. Synchronous Generating Units would be allowed to exceed their Rated MW in a limited set of circumstances specified in the Bilateral Agreement (to be determined by National Grid).

9.7.3 This arrangement does not provide any transparency regarding the requirements. From an operational perspective it will make managing the

system more complex given the possibility that each Synchronous Generating Unit could have a different set of obligations regarding the provision of Reactive Power.

'Top-Hat' Approach

9.7.4 A potential solution of providing a reactive power capability equivalent to 0.85 lagging to 0.95 leading power factor at Rated MW at Active Power outputs up to 'x%' above Rated MW ('top-hat' approach) was evaluated. Additional analysis undertaken by National Grid attempted to quantify the reinforcement required to cater solely for the loss of generator MVAr capability (compared with a capability of 0.85 power factor lagging at the output level) from those Generating Units exceeding their Rated MW. This involved redistributing the generation as in the 110% Rated MW study previously undertaken, but modelling the Generating Units with 0.85 power factor lagging capability at the increased MW output. These studies identified the reinforcements required for the altered Active Power transfers. Subtracting this requirement from the total requirement previously identified showed a need for approximately 13 MSCs in the 110% study that could be attributed to the reduced Reactive Power capability. For a 5% rise in MW output no significant additional investments were identified.

9.7.5 It was noted that these studies were very limited, having considered only one boundary and one demand level, and that further work would be necessary to inform a full cost/benefit analysis.

9.7.6 Further consideration was given to allowing generators to operate up to 105% Rated MW with a reactive capability equal to the range required at Rated MW, whilst for output levels exceeding 105%, the Synchronous Generating Unit would be required to provide a capability between 0.85 power factor lagging and 0.95 power factor leading at the higher level.

9.7.7 This approach would result in limited additional capital expenditure by National Grid (which resulted in the percentage cap). However information from the generator community indicated that it would not be possible to deliver the top hat approach within the existing thermal capability of the machine (due to physical constraints of the plant) and it would be difficult to assess whether additional investment would enable this capability without extensive tests which would take months to plan and ascertain results from.

Transient Capability Solution

9.7.8 The concept of different continuous and short term reactive power capabilities was identified as a potential solution. In practice this would mean allowing the despatch of MVAr within a reduced capability (for example 0.90 power factor lagging which is comparable to MW output 6% above Rated MW) during normal operation of the GB Transmission System. During post fault circumstances the Synchronous Generating Unit would have to be capable of providing 0.85 lagging at their pre-fault MW output level for a limited period.

9.7.9 During this time National Grid would re-configure the network to alleviate the effects of the fault. After this period of time the Synchronous Generating Unit transformer would be tapped to return the unit's output to within its performance chart. It was noted that if National Grid had not rectified the problem within the specified time slot, it would take Bid Offer Acceptances (BOA) either to reduce the MW of the unit to allow the reactive power output to be sustained or from other Generating Units in order to reduce the reactive output requirement of the unit being stressed. Initial indicators have suggested that BOA expenditure

would be significantly less than the cost of procuring additional MSCs.

9.7.10 Analysis has illustrated that it is rare for National Grid to despatch a Generating Unit outside the 0.90 lagging envelope (analysis based on sample size from Generators across the GB Transmission System) during normal operation of the GB Transmission System. The National Grid Electricity Control Room indicated that 1.5 hours was an acceptable timeline to re-configure the network to alleviate the effects of the faults and/or to issue BOAs.

9.7.11 The solution would result in a change to the leading side capability. If the capability followed the excitation limiter characteristic there would be a slight reduction in the amount of MVAr available. The magnitude of these changes is such that, in terms of voltage control, they will not have a material effect on the planning and operation of the system. Furthermore, with the exception of a few units, the lead MVAr capability is only required overnight when machines are less likely to be operating at full output.

9.7.12 This solution would not result in any additional capital expenditure to be incurred by National Grid and the other Transmission Owners and would also simplify and add clarity to the Reactive Power provisions.

9.7.13 It was recognised that this arrangement would address all of the issues. However, following further consideration it became evident that the time for which a Generating Unit can operate outside its continuous rating under all circumstances is difficult to identify and likely to be shorter than the time required by National Grid to secure the GB Transmission System. Therefore it was agreed that this proposal could not be implemented due to the technical limitations of the Synchronous Generating Units.

9.8 Market Arrangements

9.8.1 It was acknowledged that there may be some benefit in developing the existing commercial/market mechanism for the mandatory provision of reactive power which would operate alongside the formal technical requirements specified in the Grid Code. It was acknowledged that the correct mix of technical requirements and commercial arrangements could provide the optimum solution for the mandatory provision of reactive power which is required for the security of the GB Transmission System.

9.8.2 As such a formal request was made to the Balancing Services Standing Group (BSSG) to consider the following questions:

- If there was a reduction in the technical requirements for the mandatory provision of Reactive Power, from 0.85 to 0.90 on the lagging side, could the market support the procurement of the 'shortfall' of MVAr via an appropriate 'commercial/market mechanism'?

- Could the market support the procurement of MVAr for a 0.85 lagging transient (post fault) requirement? If yes, what would be the market arrangements?

9.8.3 The BSSG indicated that it would be possible to develop commercial arrangements for the provision of MVAr such that the technical provisions may be re-evaluated. The BSSG asked for additional clarification regarding the size of the potential problem such that the optimum solution may be identified and

developed accordingly.

9.8.4 Quantification of the problem would be a significant piece of work which would require time to complete. The assessment would have to consider the cost of National Grid procuring the additional MVAr (e.g. compensation equipment) against the cost to Generators of procuring larger Units which would be able to fulfil the reactive power requirements at all operating levels and as such was deemed to be a wider issue than that being considered by the proposed amendment.

9.9 New Technologies Implications

9.9.1 At May 2008 GCRP[3] National Grid presented a paper which identified potential Grid Code compliance issues for new technologies. The capability of new technology generation to comply with the existing reactive power provisions has been identified as a potential issue

9.9.2 To address the new technology and market arrangements issues, National Grid proposed the establishment of a joint BSSG/Grid Code Working Group to discuss the reactive power issues. National Grid recommended that this new Working Group complete the necessary analysis required to quantify the size of the issue and look more closely at the feasibility of modifying the existing technical performance obligations.

10. Proposed Solution

10.1.1 Given the pending review of appropriateness of the existing technical performance obligations for reactive power by a different Working Group, the proposed solution is an interim arrangement which may be summarised as follows and will:

- alleviate National Grid's concerns regarding system security;
- enable Generators to operate above Rated MW as often as possible;
- apply consistent, visible operating conditions to all generators.

10.1.2 For existing units that have conditions specified in their Bilateral Agreement relating to their reactive power capability at outputs above Rated MW, the existing arrangements will be preserved and the Grid Code will specify that for such units the Bilateral Agreement may specify the reactive capability requirements.

10.1.3 For existing units that operate above Rated MW (ie. they have a CEC (Connection Entry Capacity) greater than Rated MW) but have no relevant provisions in the Bilateral Agreement, the existing arrangements will continue and the Grid Code requirements will be unchanged.

10.1.4 For new connections, and for existing power stations that request a formal increase in their CEC, above Rated MW, the Grid Code will specify the following additional technical requirements:

- the Generating Unit must be capable of continuous operation at least 0.9 p.f. lagging;

[3] https://www.nationalgrid.com/NR/rdonlyres/18EE6072-C4DA-4526-97C1-FEE54C81E88B/25330/pp08_21_NewGenTechfinal.pdf

- the leading power factor capability will be based on the under excitation limiter characteristic;
- National Grid will be able to request that a Generating Unit submits a Physical Notification (PN) no higher than its Rated MW at no cost should it see a system need (providing the unit has a reduced reactive power capability at the higher output level). The request will be made as soon as National Grid determine there is a system need and will be at least 1 hour prior to gate closure.

10.1.5 It is also proposed to clarify that when operating at output levels other than Rated MW, Synchronous Generating Units should operate to the performance chart of the Unit.

10.1.6 The proposal will allow Generating Units to operate above Rated MW whenever possible without reducing system security or requiring Transmission System investment. The proposal will ensure greater consistency and clarity of the requirements for Generating Units.

10.1.7 The proposal includes a mechanism for enabling National Grid to instruct a Synchronous Generating Unit to resubmit their PN when there is a system need, as long as this instruction is received at least 1 hour prior to gate closure. A Transmission Related Agreement (TRA) will sit alongside the Bilateral Agreement to allow National Grid to recoup BOA costs where these have been incurred as a result of a generator failing to resubmit its PN.

11. Proposed Grid Code Changes

11.1 It is proposed to amend the Connection Conditions and Balancing Code 1 (Pre-Gate Closure) of the Grid Code such that it:

- allows generators to operate above Rated MW, and realise the benefits of using more efficient plant, when there is no risk to GB Transmission System security;
- preserves current arrangements for existing parties;
- specifies consistent, visible reactive capability requirements for new plant and existing plant wishing to increase its output;
- will not result in increase expenditure on the GB Transmission System.

11.2 The proposed changes to the relevant clauses of Balancing Code 1 (Pre-Gate Closure) and the Connection Conditions are shown in Appendix A.

12. Impact on GB Transmission System

12.1 The proposed changes will ensure that use can be made of more efficient technologies being developed for generating plant, with both cost and environmental benefits, without incurring additional system investment costs or reducing the security of the GB Transmission System.

13. Impact on Grid Code Users

13.1 The Grid Code is currently silent regarding Synchronous Generating Units' MVAr output requirements at operating levels above and below Rated MW. The proposals will provide clarity to the Grid Code community regarding the associated technical obligations for Synchronous Generating Units' operating above or below their Rated MW.

13.2 The additional technical obligations for new connections (or existing power stations requesting an increase in their unit CEC) will provide clarity to the Grid Code community and provide certainty to allow investment decisions to be made.

13.3 The existing obligations for Non Synchronous Generating Units are not impacted by this proposal and therefore not subject to any proposed amendment(s).

14. Assessment Against Grid Code Objectives

14.1 The proposed changes outlined in Grid Code Consultation A/09 (Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW) would better facilitate Grid Code Objectives:

i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;

and

ii) to facilitate competition in the generation and supply of electricity;

and

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

by providing clarity regarding the technical obligations for Generating Units exceeding their Rated MW.

15. Impact on Industry Documents

15.1 *Impact on Core Industry Documents*

15.1.1 Grid Code Consultation A/09 (Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW) has no impact upon other Core Industry Documents.

15.2 *Impact on other Industry Documents*

15.2.1 Grid Code Consultation A/09 (Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW) has no impact upon other Industry Documents.

16. Environmental Assessment

16.1 The environmental impact of the proposal will be net positive as more energy is produced from the same amount of fuel utilised by the Synchronous Generating Unit.

C. RESPONSES

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

18. Views are invited upon the proposals outlined in this report. Specially views on the following areas would be welcomed:

- Impact of the proposals on Grid Code Users.
- Clarity and transparency of the proposals for Synchronous Generating Units operating above Rated MW.
- Appropriateness of the proposed solution given the GB Transmission System requirement for MVAr, technical functionality of plant and the pending, wide ranging, Grid Code review of Reactive Power provisions.
- Any improvements or changes to the proposals that in a respondent's view would better facilitate the objectives of the Grid Code.

19. Your formal responses may be:-

Posted to: Lilian Macleod
Electricity Codes
Regulatory Frameworks
National Grid Electricity Transmission plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

Emailed to: lilian.macleod@uk.ngrid.com

APPENDIX A: PROPOSED GRID CODE CHANGES

The proposed legal text is reflective of the current Grid Code baseline as specified in Issue 3 Revision 32.

Proposed Changes to Connection Conditions

Amend CC.6.3.2 (a) and CC.A.6.2.7.1 as follows:

CC.6.3.2 (a) When supplying **Rated MW**, ~~All~~ all **Synchronous Generating Units** must be capable of ~~supplying **Rated MW**~~ continuous operation at any point between the limits 0.85 **Power Factor** lagging and 0.95 **Power Factor** leading at **the Synchronous Generating Unit** terminals. At **Active Power** output levels other than **Rated MW**, all **Synchronous Generating Units** must be capable of continuous operation at any point between the **Reactive Power** capability limits identified on the **Generator Performance Chart**.

In addition to the above paragraph, where **Synchronous Generating Unit(s)**

(iii) have a **CEC** which has been increased above **Rated MW,** and such increase takes effect on or after 1st May 2009, or have a **Completion Date** on or after 1st May 2009, the minimum lagging **Reactive Power** capability of such **Synchronous Generating Unit(s)** must be 0.9 **Power Factor** at all **Active Power** output levels in excess of **Rated MW**. Further, the **User** shall comply with the provisions of and any instructions given pursuant to BC1.8 and the relevant **Bilateral Agreement**; or

(iv) have a **CEC** in excess of **Rated MW** and a **Completion Date** before 1st May 2009, alternative provisions relating to **Reactive Power** capability may be specified in the **Bilateral Agreement**, and where this is the case such provisions must be complied with.

The short circuit ratio of **Synchronous Generating Units** shall be not less than 0.5.

CC.A.6.2.7.1 The security of the power system shall also be safeguarded by means of MVAr **Under Excitation Limiters** fitted to the generator **Excitation System**. The **Under Excitation Limiter** shall prevent the **Automatic Voltage Regulator** reducing the generator excitation to a level which would endanger synchronous stability. The **Under Excitation Limiter** shall operate when the excitation system is providing automatic control. The **Under Excitation Limiter** shall respond to changes in the **Active Power** (MW) and the **Reactive Power** (MVAr), and to the square of the generator voltage in such a direction that an increase in voltage will permit an increase in leading MVAr. The characteristic of the **Under Excitation Limiter** shall be substantially linear from no-load to ~~rated load~~ the maximum **Active Power** output of the **Generating Unit** at any setting and shall be readily adjustable.

Proposed Changes to Balancing Code 1 (Pre Gate Closure Process)

Insert new clause.

BC1.8 Provision of **Reactive Power** capability

BC1.8.1 Under certain operating conditions **NGET** may identify through its **Operational Planning** that an area of the **GB Transmission System** may have insufficient **Reactive Power** capability available to ensure that the operating voltage can be maintained in accordance with **NGET's** licence standards.

In respect of **Synchronous Generating Unit(s)**

(v) that have a **CEC** in excess of **Rated MW;** and

(vi) that are not capable of continuous operation at any point between the limits 0.85 **Power Factor** lagging and 0.95 **Power Factor** leading at the **Synchronous Generating Unit** terminals at **Active Power** output levels higher than **Rated MW**; and

(vii) that have either a **Completion Date** on or after 1st May 2009, or where its **CEC** has been increased above **Rated MW** such increase takes effect on or after 1st May 2009; and

(viii) that are in an area of potential **Reactive Power** capability deficiency,

NGET may instruct the **Synchronous Generating Unit(s)** to limit its submitted **Physical Notifications** to no higher than **Rated MW** for a period specified by **NGET**. Such an instruction must be made at least 1 hour prior to **Gate Closure**, although **NGET** will endeavour to give as much notice as possible. The instruction may require that a **Physical Notification** is re-submitted. The period covered by the instruction will not exceed the expected period for which the potential deficiency has been identified. Compliance with the instruction will not incur costs to **NGET** in the **Balancing Mechanism**. The detailed provisions relating to such instructions will normally be set out in the relevant **Bilateral Agreement.**

APPENDIX C: CONSULTATION RESPONSES TO THE PROPOSED CHANGE

The following Appendix contains copies of all representations received from Authorised Electricity Operators through the consultation period.

Original Responses to A/09 Consultation

No.	Company	File Number
1	British Energy (part of EDF Energy)	A/09-CR-01
2	E.ON UK	A/09-CR-02
3	Magnox North	A/09-CR-03
4	RWE Group	A/09-CR-04
5	SAIC on behalf of Scottish Power Energy Wholesale	A/09-CR-05
6	SSE Generation	A/09-CR-06

National Grid Replies to Consultation Responses

No.	Company	File Number
1	British Energy (part of EDF Energy)	A/09-CRR-01
2	E.ON UK	A/09-CRR-02
3	Magnox North	A/09-CRR-03
4	RWE Group	A/09-CRR-04
5	SAIC on behalf of Scottish Power Energy Wholesale	A/09-CRR-05
6	SSE Generation	A/09-CRR-06

Reference	A/09-CR-01
Company	British Energy (part of EDF Energy)

From: Evans James [mailto:james.evans@british-energy.com]
Sent: Monday, March 16, 2009 4:36 PM
To: Macleod, Lilian
Cc: Rome Rob; Mate Martin; Schmitz Louise; Morris John
Subject: Grid Code Consultation - A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Hello Lilian,

Thank you for the opportunity to respond to this consultation and this response is made on behalf of British Energy part of EDF Energy.

We broadly agree that there are some merits in implementing this proposed change; however, we would caveat this with one comment.

- We consider that this should be implemented as an interim solution only and would welcome some clarity of the expected duration for this change.

Regards

James Evans
Trading Consultant
Trading and Sales, British Energy - part of EDF Energy

Reference	A/09-CR-02
Company	E.ON UK

E.ON UK plc
Westwood Way
Westwood Business Park
Coventry
CV4 8LG
eon-uk.com

Claire Maxim
T +44 (0)2476 183226
M +44 (0)7595 125089

claire.maxim@eon-uk.com

Lilian Macleod
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

Monday 16th March 2009

Dear Lilian,

A/09 – Requirements for Synchronous Generators exceeding Rated MW

Thank you for the opportunity to response to the above consultation. This response is on behalf of E.ON UK.

We support the proposed changes. There are some minor improvements which could be made to the legal text.

Because CEC is measured at HV and Rated MW is LV there is always the potential for confusion. It is therefore important to say at the "Synchronous Generating Unit terminals" every time Power Factor is mentioned.

There may be confusion because the word "limits" is used to reference Reactive Power range. This could be misinterpreted as intending to restrict the reactive power output of the Synchronous Generating Unit, which is not the intention.

If you have any queries, please do not hesitate to contact me on the above number.

Yours sincerely

Claire Maxim
Trading Arrangements

E.ON UK plc
Registered in
England and Wales
No 2366970
Registered Office:
Westwood Way
Westwood Business Park
Coventry CV4 8LG

1 | 1

Reference	A/09-CR-03
Company	Magnox North Ltd

From: david.m.ward@magnoxnorthsites.com
Sent: Monday, March 16, 2009 3:06 PM
To: Macleod, Lilian
Subject: Grid Code Consultation - A/09

(By email)

Lilian

Grid Code Consultation Paper A/09 – Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

This email is the formal response of Magnox North Ltd to the above consultation paper. Magnox North Ltd operates the operational Magnox Power Station sites on behalf of the Nuclear Decommissioning Authority.

The proposed change has no material effect on the Magnox power stations, as they are not able to operate above rated megawatts, so we have no strong view. The proposed change seems a sensible compromise between one extreme of preventing generators from ever operating above rated megawatts, and the other extreme of allowing a free-for-all where rated megawatts effectively has no meaning.

Our comments are not confidential

Regards

David Ward

Magnox North Ltd
Berkeley Centre
Berkeley
Gloucestershire, GL13 9PB

Reference	A/09-CR-04
Company	RWE Group

RWE Supply & Trading

RWE
The energy to lead

Ms L Macleod
Electricity Codes, Commercial Frameworks
National Grid Electricity Transmission plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

lilian.macleod@uk.ngrid.com

Name John Norbury
Phone +44 (0)1793 892667
Mobile +44 (0)7795 354382
E-Mail john.norbury@RWE.com

16th March 2009

Dear Lilian

Grid Code Consultation Document A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for the opportunity to comment on the above Grid Code consultation. The following response is provided on behalf of the RWE group of companies, including RWE Npower plc, RWE Trading GmbH and RWE Innogy GmbH. RWE was pleased to participate in the working group and is generally supportive of the aims of the proposed change. However, we have a few comments on the proposed text as follows:

CC.6.3.2 (a) Given the reference to the Generator Performance Chart it is suggested that OC2 Appendix 1 be amended to illustrate operation above Rated MW (i.e. 500MW in the example given)

CC.6.3.2 (a) (ii) Insert "or *the sum of Rated MW of the Generating Units comprising a CCGT Module*" after "Rated MW", line 1.

BC.1.8.1 (iv) This clause refers to a "deficiency" in reactive power capability, although there is no other reference to this term. To clarify that this deficiency relates to the circumstances described in the first paragraph, we suggest the clause be amended to: "that are in an area of potentially insufficient Reactive Power ~~deficiency~~ capability as described in this clause BC1.8.1."

I trust you will find the above comments helpful.

Yours sincerely

by e-mail

John Norbury
Network Connections Manager

RWE Supply & Trading GmbH
Swindon Branch
Windmill Hill Business Park
Whitehill Way
Swindon SN5 6PB
United Kingdom
T +44(0)1793/87 77 77
F +44(0)1793/89 25 25
I www.rwe.com
Registered No. BR 7373
VAT Registration No.
GB 524 921354
Advisory Board:
Dr Ulrich Jobs (Chairman)
Management Board:
Peter Terium (CEO)
Dr Bernhard Günther
Stefan Judisch
Dr Peter Kreuzberg
Member of the extended Board of Directors (General Representative):
Dr. Wolfgang Peters
Head Office:
Essen, Germany
Registered at:
Local District Court, Essen
Registered No.
HR B 14327

Reference	A/09-CR-05
Company	SAIC on behalf of Scottish Power Energy Wholesale

Lilian Macleod
Electricity Codes
Regulatory Frameworks
National Grid Electricity Transmission plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

Ref GC A/09
Date 12th March 2009

Tel No. 01355 845208
Email: ukelectricityspoc@saic.com

Dear Lilian,

Consultation Document for A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

ScottishPower welcomes the opportunity to provide comment on the above consultation. This response is submitted on behalf of ScottishPower's Energy Wholesale Business, which includes ScottishPower Generation Ltd and ScottishPower Energy Management Ltd.

ScottishPower are supportive of the proposed changes to the Grid Code. These interim changes will allow plant, where improvements have been made, to continue operating under their current arrangements, while providing an avenue for new or existing plant to carry out any required upgrade work. We look forward to a fair and equitable solution emerging from the working group to provide a long term, permanent solution.

I trust that you will find these comments helpful. Nonetheless, should you require further clarification of any of the above, please do not hesitate to contact me.

Yours sincerely,

Gary Henderson

For and on behalf of: ScottishPower's Energy Wholesale Business which includes ScottishPower Generation Ltd and ScottishPower Energy Management Ltd.

Registered Office: SAIC Ltd., 8-9 Stratton Street, Mayfair, London W1J 8LF
Registered in England Reg. No. 1396396
www.saic.com

Reference	A/09-CR-06
Company	SSE Generation Ltd

From: Campbell.McDonald@scottish-southern.co.uk
Sent: Monday, March 16, 2009 5:33 PM
To: Macleod, Lilian
Subject: Re: Grid Code Consultation - A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Lilian

The proposed change seems very sensible; therefore SSE Generation Ltd is happy to support this change.

Kind regards

Campbell McDonald

Generation Operations Manager
SSE Generation Ltd

Reference	A/09-CRR-01
Company	British Energy (part of EDF Energy)

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

James Evans
Trading and Sales
British Energy – part of EDF Energy
Barnett Way
Barnwood
Gloucester
GL4 3RS

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear James

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 16th March 2009. We note your general support of the proposed revisions to the Grid Code.

In your reply you note that the proposals are an interim measure only and requested clarity regarding the expected duration of this change. It is the intention that the proposals as outlined by Grid Code Consultation A/09 will be an interim solution. National Grid anticipate that a joint Grid Code/Balancing Services Standing Group (BSSG – CUSC) Working Group will be established later this year to consider all aspects relating to reactive power, such as the Grid Code requirements and reactive market arrangements (the Grid Code Review Panel have already agreed to this Working Group being established). It is likely that this group will recommend Grid Code changes in respect of reactive power capability requirements. British Energy, as a Grid Code User, will be invited to participate in the Working Group.

Thank you for taking time to respond to this consultation. Your comments will be included in the associated Report to the Authority. It is National Grid's intention to submit the 'Report to the Authority' to OFGEM by the end of March 2009.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy

Reference	A/09-CRR-02
Company	E.ON UK

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Claire Maxim
Trading Arrangements
E-ON UK plc
Westwood Way
Westwood Business Park
Coventry
CV4 8LG

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear Claire

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 16th March 2009. We note your support of the proposed revisions to the Grid Code. In your reply you suggest changes which could be made to the proposed Grid Code text.

National Grid agrees that it is important to clarify that the Reactive Capability requirement is at the generating unit terminals. We have modified CC.6.3.2 (a)(i) accordingly. We believe this to be the only instance where the proposed text does not specify the unit terminals.

We note your comment on the use of "limits". The existing clause CC.6.3.2 is specified in this way and the proposed new wording referring to limits identified on the performance chart is consistent with the specification of the chart in OC2.4.2.1. We believe that changing this wording should be discussed more widely and we would welcome discussion on this issue in the Reactive Power Working Group that we anticipate will be established later in the year.

Thank you for taking time to respond to this consultation. Your comments will be included in the associated Report to the Authority. It is National Grid's intention to submit the 'Report to the Authority' to OFGEM by the end of March 2009.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy

Reference	A/09-CRR-03
Company	Magnox North Ltd

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

David Ward
Magnox North Ltd
Berkeley Centre
Berkeley
Gloucestershire
G13 9PB

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear David

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 16th March 2009. Your comments will be included in the associated Report to the Authority.

Thank you for taking time to respond to this consultation.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy

Reference	A/09-CRR-04
Company	RWE Group

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

John Norbury
Network Connections Manager
RWE Supply and Trading GmbH
Windmill Hill Business Park
Whitehill Way
Swindon
SN5 6PB

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear John

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 16th March 2009. We note your general support of the proposed revisions to the Grid Code. In your reply a few comments were made on the proposed legal text:

- **CC6.3.2 (a) – Generator Performance Chart**
  In your response it is suggested that given the reference to the Generator Performance Chart, OC2 Appendix 1 is amended to illustrate operation above Rated MW.

  We believe that there is benefit in your proposal to extend the example chart to show operation above Rated MW. However, having considered the example and the wording of OC2.4.2.1 we believe that the changes required would be sufficiently significant to require industry consideration, which would not be the case if we were to include them in our report to OFGEM. For example we may need to add a stator limit curve to the chart and lines to indicate the power factor at various active power output levels. We would welcome discussion on this issue in the Reactive Power Working Group that we anticipate will be established later in the year.

- **CC.6.3.2 (a) (ii)**
  National Grid agreed with RWE's suggestions regarding the proposed amendments to the paragraph and note that this clarification would provide greater transparency regarding the intention of the provision. National Grid will make the proposed amendments to the legal text that has been consulted upon. We have also similarly modified the text of CC.6.3.2 (a) (i), BC1.8.1(i) and BC1.8.1 (iii).

- **BC.1.8.1 (iv)**
  In your response you suggest alternative wording such that it provides additional clarification to Users regarding the intent of the provision. National Grid agrees and will make the proposed amendments to the legal text that has been consulted upon.

Thank you for taking time to respond to this consultation. Your comments will be included in the associated Report to the Authority. It is National Grid's intention to submit the 'Report to the Authority' to OFGEM by the end of March 2009.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy

Reference	A/09-CRR-05
Company	SAIC on behalf of Scottish Power Energy Wholesale

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Gary Henderson
SAIC Ltd
5 Redwood Place
Peel Park - Business Park
East Kilbride
G74 5PB

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear Gary

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 12th March 2009.

We note your support of the proposed revisions to the Grid Code. Your comments will be included in the associated Report to the Authority.

Thank you for taking time to respond to this consultation.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy

Reference	A/09-CRR-06
Company	SSE Generation Ltd

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Campbell McDonald
Generation Operations Manager
SSE Generation Ltd
Grampian House
200 Dunkeld Road
Perth
PH1 3AQ

Lilian Macleod
Senior Regulatory Analyst

Lilian.Macleod@uk.ngrid.com
Direct tel 01926 656368

www.nationalgrid.com

26th March 2009

Dear Campbell

Grid Code Consultation A/09: Grid Code Requirements for Synchronous Generating Units Exceeding Rated MW

Thank you for your comments on the above Grid Code consultation received on 16th March 2009.

We note your support of the proposed revisions to the Grid Code. Your comments will be included in the associated Report to the Authority.

Thank you for taking time to respond to this consultation.

Yours sincerely

Lilian Macleod
Senior Regulatory Analyst, Regulation Strategy