A joint Grid Code Review Panel and Distribution Code Review Panel Working Group

Licence Exempt Embedded Medium Power Stations, LEEMPS

Final Report for GCRP & DCRP
July 2005

Contents

Summary

The Grid Code Review Panel and the Distribution Code Review Panel set up a joint working group in May 2003 following discussions between NGC, a number of DNOs, Ofgem and the DTI on how changes to the licence exemption regime could be reflected in the Industry Code framework. The main objective was to ensure that existing technical requirements in the Grid Code are transparently applied to Medium Power Stations in a robust manner, such that Generators owning only Medium Power Stations would not need to have any enduring requirement for an agreement with NGC.

The working group has reviewed a number of possible ways in which the current Grid Code obligations in relation to embedded Medium Power Stations could be best placed on Generators. The group have noted and discussed a number of issues in relation to the possible options and have agreed that a framework where the current Grid Code obligations are passed through to the host Distribution Network Operator, DNO, by the Grid Code would be most appropriate. The host DNO would then place the same obligations on the Generator through the Distribution Code, thus satisfying the DNO obligations in the Grid Code.

Having agreed on the high level mechanism the Working Group then reviewed the practical processes involved with this approach. In particular, the group reviewed the connection process and how the proposed mechanism might work. This highlighted a number of areas that the Working Group believe may need further review under the CUSC, should the preferred mechanism be taken forward.

The Working Group then reviewed drafting for both the Grid Code and the Distribution Code that would serve to establish the proposed mechanism. Through several meetings the drafting was discussed and aligned. For each obligation passed through any issues were identified and debated. The working group did not review the actual obligations themselves, but rather ensured that the drafting adequately allowed for the pass through of the relevant obligations, whether this drafting raised any further issues and finally whether the proposed Grid Code and Distribution Code drafting worked together. There were a few areas, notably the provision of mandatory services, to which it became clear that the proposed mechanism did not lend itself very well i.e. a direct contractual relationship was required. In such cases NGC separately reviewed the drafting and proposed changes that enabled the objectives of this Working Group to be met.

The working group has now reached the stage where it believes the Terms of Reference have been met and seeks the GCRP and DCRP formal acceptance of the work carried out. It also further recommends that the drafting developed by the working group be taken forward to the consultation stage. In the case of the Distribution Code the consultation would also include BETTA changes. The group identified a possible need for complementary changes to the CUSC and suggested that this matter be referred to the CUSC Panel for consideration under the CUSC governance.

Introduction

This report is provided by the LEEMPS working group to the GCRP and DCRP. It summarises the work carried out by the working group. It includes a recommended mechanism for passing through Grid Code obligations to Licence Exempt Embedded Medium Power Stations. It also provides drafting for the Grid Code and Distribution Code that would put in place the recommended mechanism.

This report is split into a number of sections, the main ones being; background, process and drafting. The first, background, explains why and how the working group was initiated. The second largely details the process the working group followed to establish a number of possible solutions and then select a preferred option. This also includes the work the group carried out on how the preferred option would fit into a connection process. The third covers the Grid Code and Distribution Code drafting that has been discussed at the working group to implement the preferred option.

This report also highlights the areas of the CUSC that the working group believes would benefit from a review should the preferred option be taken forward.

The report contains a number of models that could be implemented to define the relationship between NGC and a Generator in relation to Grid Code requirements on medium embedded power stations. Each model has been reviewed and the group has recommended a preferred model for a contractual framework, which in summary is an indirect relationship between NGC and a Generator, facilitated through the DNO. The co-ordinated Grid Code and Distribution Code drafting to implement this preferred model is also presented and it is recommended that it be taken forward for Industry consultation. The working group believes it has met the requirements under the Terms of Reference.

Background

The need for a working group was identified following discussions between NGC, Network Operators, the DTI and Ofgem. It became apparent that the contractual framework in respect of Licence Exempt Medium Power Stations was not transparent or robust following the introduction of Licence exemption arrangements for Medium Power Stations. Essentially, the contractual framework does not allow for Grid Code requirements to be enforced by NGC without a direct relationship with a Generator.

The DTI and Ofgem agreed that an interim measure should be put in place for Round One wind farms to prevent any delay in advance of the wider framework being amended. This interim measure has two main elements. Firstly, a Generator is required to enter into an agreement with NGC to fulfil the main requirements of the Grid Code. Secondly, NGC seeks a derogation from the remaining requirements of the Grid Code. In parallel with this arrangement, the licensees agreed to review the industry codes and take forward the development of a more robust arrangement.

These interim agreements, Licence Exempt Generator Agreements (LEGAs), are now in place and NGC also has derogations in place. The derogations expire in April 06. NGC and the DNOs submitted a paper on this issue to both the Grid Code Review Panel and the Distribution Code Review Panel (Appendix 1). This recommended the setting up of a joint working group to investigate the option and included proposed Terms of Reference. This was accepted by both Panels.

Working group Membership / ToRs

The joint working group established as a result of discussions at the GCRP and DCRP had the following membership:

Andy Balkwill / Ben Graff	NGC (Chair)
Sue Newbould	NGC (Technical Secretary)
Mike Kay	UU
Charlie Zhang	EDF Energy
John Norbury	RWE
Guy Nicholson / James Glennie	BWEA
Bridget Morgan / Steve Argent	Ofgem (observer)
Nigel Turvey	Western Power Distribution
Chris Berry	SP Power Systems
Claire Maxim	E.ON UK
Patrick Hynes	NGC

The final agreed ToRs are attached as Appendix 2.

The working group has met 9 times, on:

1st Meeting 23 September 2003
2nd Meeting 14 October 2003
3rd Meeting 1 December 2003
4th Meeting 12 May 2004
5th Meeting 18 June 2004
6th Meeting 26 August 2004
7th Meeting 12 October 2004
8th Meeting 28 January 2005
9th Meeting 29 June 2005

The agreed minutes of working group meetings and actions are available on the NGC Industry Information web site:

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

Options

The working groups firstly reviewed the Terms of Reference. Except for a few minor changes, the group agreed they were appropriate. The minor changes were presented and agreed at the following GCRP / DCRP meetings.

Initially the group agreed to list out various options or models that could be used to achieve the main objectives in the Terms of Reference i.e. a transparent and binding long term mechanism to allow Grid Code obligations to be enforced.

The group then reviewed the possible options / models in greater detail. Over a number of meetings each option was discussed in depth and a few further options recorded. The issues associated with main options were listed and discussed. The final table of options is attached as Appendix 3 to this report. In summary the options discussed were:

	Option / mechanism	Description
1	CUSC to DNO to Generator	The CUSC places an obligation on the DNO to ensure that the Generator complies with relevant Grid Code obligations.
2	Grid Code to DNO to Generator	The Grid Code places an obligation on the DNO to ensure that the Generator complies with relevant Grid Code obligations.
3	NGC to Generator	A direct agreement, outside the CUSC framework, between NGC and the Generator, Licence Exempt Generation Agreement.
4	CUSC to Supplier to Generator	CUSC places an obligation on Suppliers to ensure the Supplier only contracts with Generators that are 'Grid Code compliant'.
5	Distribution Code to Generator	All generator requirements identified under the D Code Panel and implemented through the D Code.
6	Review Licence Exemption criteria	Change the Generator Licence such that 50 – 100 MW Power Stations are required to comply by licence with certain Grid Code obligations.
7	Grid Code to Supplier to Generator	As option 4, but the obligation on the Supplier is in the Grid Code rather than the CUSC.
8	Market Solution	There is no Grid Code requirement and NGC contracts with individual Generators for compliance.
9	Do nothing	NGC seek life time derogations / GC change to allow NGC not to apply the GC to licence exempt plant.
10	Commercial Buyout	Developers chose to pay for non-compliance or be paid for compliance.

The table in Appendix 3 also shows the working group's view of the various options; how the group considered each option would be perceived; and whether it would be acceptable to various stakeholders.

The group then considered possible criteria that each option could assessed against in order reach a preferred option. The agreed criteria the group established was:

- The need for derogations
- Transparency
- Compliance with Licence / Statutes / Laws
- Obligations consistent with parties' normal duties / activities
- Practicality / simplicity / efficiency
- Ability to enforce
- Governance route
- Resilient / robust / endurable

Applying the above criteria to the list of options the working group very quickly established that some of the options did not appear to be viable and so should not be investigated further.

Options 4 and 7, the obligation being passed through the Supplier, through either the CUSC (option 4) or the Grid Code (option 7), failed on a number of criteria, but mainly that obligations should be placed on the party who has a direct interest.

Option 6, a review of the Licence criteria, required changes to statues and laws was outside the governance of the Grid Code and would not directly remove the requirement for a derogation and so was rejected.

Option 8, no Grid Code requirement, failed on practicality, but may provide a solution for certain requirements in the longer-term if and when markets have developed.

Option 3, NGC contracting directly with the Generator, failed on the basis that it was not transparent and is unlikely to be acceptable to the majority of industry participants and the DTI. Being outside the normal Industry Framework it was considered as less enforceable. As well as the general transparency issues it also fails on wider governance. However, it could work if the Generator signed up to the CUSC and hence was bound to the technical requirements, although this was seen as counter to the 'one stop shop' philosophy so was not taken forward.

Option 9, do nothing, was felt to be unsustainable in the long-term and failed on transparency. The current LEGA arrangements have always only ever been envisaged as a temporary arrangement. A LEGA is not transparent and there is no real governance associated with it. A change is required in order to allow the DTI to consider further automatic exemption of Medium Power Stations in the future. Also the existing derogations expire in April 2006 and this solution does not address that issue.

Option 10 was seen as quite a radical solution that was not reasonably practicable. The solution also ranged beyond the influence of the Grid Code and D Code.

The working group then went on to consider the remaining two options in some detail. Option 1 would involve the CUSC placing obligations on a DNO to ensure Power Stations connected to its system complied with the technical conditions in the Grid Code. Option 2 is very similar except that the obligation on the DNO rests in the Grid Code (note compliance with the Grid Code is contractual requirement of the CUSC).

The main difference between options 1 and 2 is that option 1 involves three sets of governance arrangements (D Code, CUSC and Grid Code), whereas option 2 is limited to just the Grid Code and the D Code. On the basis of governance simplicity option 2 appears to be preferable.

For either option 1 or 2 it was noted that should a Generator be unable to comply with the requirements it would be in breach of the D Code or the DNO connection agreement. It was also noted that the Generator could not seek a derogation, this would need to be done by the DNO and / or NGC. Ultimately, under very extreme circumstances NGC could require the DNO to de-energise a Power Station and the DNO may need some form of indemnity to be provided by NGC, an extension of CUSC 6.5.4.

Overall it was agreed that option 2 was preferable, but it was noted that certain commercial arrangements, particularly under the CUSC, and possibly the DNO to Generator connection agreements, needed to be considered / validated under this relationship. The working group agreed to take forwards more in depth work on the development of a robust solution based on option 2.

Drafting considerations for option 2

To aid the working group NGC produced a summary of the areas of the Grid Code related Medium Power Stations. This was discussed and refined by the working group. The final version is attached as Appendix 4.

It was confirmed by National Grid that the Grid Code as drafted made no distinction between Licensed and un-Licensed Generators. It was noted that directly connected and embedded Medium Power Stations could have different requirements in the Grid Code. The technical requirements would generally be the same for directly connected and embedded, but the operational interface (assuming they were not BMUs) could be different i.e. normal operational contact limited to the host system operator.

It was agreed that NGC would still require some form of relationship with a Generator to ensure compliance. NGC indicated that non intrusive testing would be preferable as a first option e.g. supplying of evidence of compliance, and this fitted very well with option 2. More intrusive procedures would only be required where unsatisfactory evidence had been supplied.

The final version of the requirements, as amended following working group discussion and attached as Appendix 4, was then used as a basis to develop drafting for the Grid Code and D Code. This drafting was produced for option 2 only.

The current Planning Code assumes that data submission is 'initiated' by the submission of an application or modification under the CUSC to NGC. It was noted that this process would be different for embedded Medium Power Stations who chose not to accede to the CUSC and the drafting would need to reflect this. It was agreed that the working group would need to look at the overall connection process to decide when and how data would be exchanged between parties.

The working group reviewed the data requirements under the Grid Code and Distribution Code. Appendix 9 is a comparison of the current requirements under the Grid Code with those of the Distribution Code discussed at the working group.

It was noted that the Connections Conditions as drafted applied to Medium Power Stations, and also that the proposed changes under Generic Provisions was with Ofgem for consideration. The working group agreed the final drafting would need to incorporate the Generic Provisions elements, but for the purposes of the working group drafting should proceed on the current version of the Connection Conditions. The Generic provisions elements could be added at a later stage following a decision from Ofgem. The Generic Provisions elements have now been added and were discussed with this report by the working group.

Although a Medium Power Station was required to have the capability for reactive and frequency response through CC6.3, it was unclear as to how they would deliver these services to NGC through CC8.1 and the CUSC if they were not CUSC parties / BM participants. NGC agreed to review how CC8.1 might work in producing the drafting. Ultimately the drafting as proposed removes the requirement for an embedded Medium Power Station to provide the services, although it retains the requirement to have the capability. It is envisaged that Users would, if they chose to, enter in to other commercial or contractual arrangements with NGC (or host DNO) to provide these as services.

In the Operating Code the main area that required debate for drafting purposes was how OC5 testing could be facilitated. The final drafting reflects a pragmatic view that in most cases on site testing would not be required, but ultimately NGC could call for a test to be performed. There was considerable debate over who should bear the cost of such test. The group concluded that with out a direct contractual relationship between NGC and the Generator that it should be dealt with by discussions between NGC, the host DNO and the Generator at the time of the tests. This was accepted on the basis that test were extremely unlikely to be called if the correct evidence had been produced.

In working through the code NGC identified some ambiguity in the existing code between BC3 and the Connection Conditions in respect of the provisions of limited high frequency response from Medium Power Stations. The provision of response to high frequency is covered in BC3.7.2. This essentially requires that above 50.4Hz a generator reduces active power output by a rate of 2% per 0.1 Hz deviation in frequency above 50.4 Hz. (i.e. at 50.4 Hz no decrease is expected, at 50.5 the output should have reduced by 2%). CC6.3.6/7 requires the control feature to be installed, but is unclear if it is to be selected as default for operation. NGC proposed that this should be clarified in the drafting.

The group discussed this requirement, and agreed with NGC that the general industry understanding was that all Medium Power Stations were required to operate in Limited Frequency Sensitive Mode, but did not agree that this change should be clarified through LEEMPS. NGC agreed to take this work forward separately.

Grid Code drafting to support Option 2

The working group considered in detail the drafting produced by NGC to implement option 2. Drafting was also circulated for parts of the D Code; the changes are discussed in more detail in the next section. Over a number of meetings the drafting for the D Code and the Grid Code was reviewed and aligned by the working group. The final drafting contained in the Appendices 7 and 8 to this report represent the changes the working group believe would be required to implement option 2 in accordance with the requirements to the Terms of Reference. The proposed changes to each section of the Grid Code are summarised below.

Planning Code

The drafting for the Planning Code involves moving the obligation to supply data in respect of Embedded Medium Power Stations from being on the Generator to the host DNO. This reflects the fact that NGC have no direct agreement with the Generator. Confidentiality requirements in the CUSC between the DNO and NGC would cover the data exchanged. The DNO would need to be able to supply this data to NGC under either the D Code or the connection agreement with the Generator.

In discussing the flow of data the group discussed two main areas, the process following a connection application and the ongoing annual update process. The group did not see any major issues in the annual update area, but an ‘initiator’ had to be constructed for the planning process as there was no CUSC application to kick the process off.

In order to understand the connection process in relation to exchanging data the group mapped out how it envisaged the interfaces and processes would work and when data would flow. Appendix 5 was used to understand the possible interfaces between the Generator, DNO and NGC. Appendix 6 reviews the connection process timescales.

The drafting assumes the same data is required to flow under the existing requirements although it is provided by the DNO. It would be up to the DNO if it collected and then passed the data on to NGC or required the Generator to pass the data to NGC directly on its behalf. Under either process the obligation remains with the DNO. The actual drafting requires the data to be sent as soon as reasonably practical after the receipt of the application from the Generator to the DNO for connection to the DNOs system.

New section under PC4.4.3, PC4.4.4, PC4.5.3 seek to describe when in the connection process data is required to be exchanged. Changes to PC5.2, PC5.4, PC5.5 also clarify how such data will be treated e.g. connected planning data, preliminary project planning data and committed project planning data, along with PC4.3.1 this provides the level of confidentiality. The data provided to NGC, although in practice it may be from the Generator, is provided through the contractual relationship in the CUSC, therefore the CUSC confidentiality provisions will apply to this data between NGC and the DNO.

Connection Conditions

The technical obligations are drafted such that DNOs are required to ensure that Embedded Medium Power Stations (that do not have a direct agreement with NGC) within its host network comply with the relevant Grid Code obligations. These obligations are the existing technical requirement in the Grid Code [to be updated for Generic Provisions] relevant to Embedded medium Power Stations (except for CC8.1). In general the two main areas of compliance are CC5, the exchange of information and reports referred to in the Connection Conditions, and CC6 the technical requirements to be provided by NGC in relation to the transmission system and the Generator in relation to Generating Units at its Power Stations to ensure the security and quality of supply over the whole system.

The information requirements have been drafted separately under a new section CC5.2.2 and cover updated data, any protection arrangements and site naming.

The technical requirements are summarised in a new section CC3.4. This covers the unit technical requirements for transmission system reasons and how the unit and system should interact (e.g. harmonics). In summary these requirements are:

- CC6.1 withstand of grid frequency variations and waveform quality
- CC6.3.2 minimum reactive and short circuit ratio requirements
- CC6.3.3 maintenance of active output under extreme frequencies
- CC6.3.4 performance under steady state conditions
- CC6.3.6/7 minimum control arrangements
- CC6.3.8 performance of excitation system
- CC6.3.9 load inaccuracies
- CC6.3.10 withstand capability for NPS
- CC6.3.12 frequency sensitive relays
- CC6.3.13 protection arrangements at extreme frequencies
- CC6.4.4 provisions of real time metering

In addition to including the above list in CC3.4 there have been a number of changes to the individual sections in this list, these serve to clarify that the contractual relationship is between NGC and the DNO rather than NGC and the Generator directly.

CC6.4.4 is a new section reflecting the existing requirements in CC6.5.8 to provide metering requirements. Reflecting the different relationship, but understanding that a unit could have an impact on operations, CC6.4.4 requires metering to be provided, but only if NGC can demonstrate an impact on the transmission system. This new section also acknowledges that in most cases this would most efficiently be provided through the host DNO.

The working group discussed the potential for the existing requirements to provide System Ancillary Services to NGC under CC8.1 without a direct contractual relationship between NGC and the generator under the CUSC. The conclusion was that without a direct relationship through CUSC the requirements of CC8.1 could not be fulfilled. This is one area where the group acknowledged that the requirement, that is essential contractual in nature, would have to be relaxed to facilitate option 2.

The relaxation of CC.8.1 covers the requirement for all Medium Power Stations to provide a frequency response service on a mandatory basis and all embedded Medium Power Stations to provide a reactive service. It was felt by the group that in respect of frequency no distinction should be made for embedded and directly connected units, given the nature of the obligation this could be considered as discriminatory. However, the group agreed with NGC that the reactive requirement was more of a local requirement and it was reasonable to retain this requirement for directly connected Medium Power Stations. This does not remove the requirement to have the capability under CC6.3 or restrict either NGC or the Generator, from seeking to enter in to a commercial arrangement for these services.

It is worth noting that the above requirements are the minimum technical requirements in relation to NGC's obligations in respect of the quality and security supplied from and to transmission system. There may be additional local technical requirements, e.g. protection, islanding capability, etc. placed by the DNO through existing D Code obligations or through the connection agreement to ensure that the DNO can also meet its wider obligations.

Operating Codes

The changes to OC1 are intended to remove and clarify that the NGC interface is with (or contractually through) the DNO rather than as at the moment with the Generator. The existing requirement for output schedules (where reasonably required) has been clarified as on the DNO rather than the Generator. In is envisaged that the DNO will comply by passing through such obligations directly i.e. require the generator to submit the data directly to NGC.

The change to OC2 also clarified that the contractual route for data exchange is between NGC and the DNO in respect of Medium Power Stations connected within its distribution system.

How the requirements of OC5, essentially testing, could be facilitated under option 2 was debated at some length in the working group. In order to ensure that the technical requirements could be validated two main changes were made to OC5. The text clarifies that OC5 would be used to validate performance at a level other than BM Unit i.e. CCGT module and Generating Unit level. Also new section, OC5.8, was also added to describe the process and relationship between NGC, the DNO and the Generator in order to facilitate any compliance assurance. Essentially this new section requires that a DNO would provide NGC with written confirmation and evidence of compliance. The Distribution Code has new matching drafting to put this arrangement into effect.

NGC expected that in most cases the provision of evidence for compliance would be sufficient, although believed that additional testing requirements had to be drafted as a backstop. The group debated how this could be facilitated and any compensation for testing would be dealt with. The drafting presented in this report requires that the DNO facilitate such test to ensure compliance. Given the expected rare occurrence of these tests, noting that there was no formal relationship between NGC and the Generator and that it was generally in all parties interests to ensure plant complied it was concluded that any compensation would need to be agreed outside the Grid Code and at the time of testing.

Minor changes have also been drafted for OC12 to clarify the relationship under option 2, essentially that the DNO would be responsible for liaising with the Generator.

Glossary and Definitions

In order to support the drafting four new definitions have been required. These essentially recognise a number of entities associated with contractual relationship between the DNO and Generator. These were mainly required as time stamps for the exchange of information during the connection process.

Distribution Code drafting to support Option 2

The changes to the Distribution Code in Appendix 6 also include changes required as a result of BETTA. The changes to support option 2 of LEEMPS are mainly covered in:

- DPC7.3.3, provision of data
- DPC 7.5, technical requirements for Medium Power Stations
- DOC 5, procedure for compliance

The revision to DPC7.3.3 requires that LEEMPS would supply data required under Grid Code PC.3.3. As noted previously PC.3.3 is a new section in the Grid Code that summarises the planning code data requirements (which are an existing requirement) for embedded Medium Power Stations. The drafting also removes the regional differences that were required under the pre-BETTA arrangements.

A new section DPC7.5 passes through the requirement for a Generator with an Embedded Medium Power Station to comply with technical conditions in the Grid Code summarised in CC.3.4. These reflect the existing technical condition on an embedded Medium Power Station in the Grid Code.

DPC7.5 also covers the requirement for a Generator to provide evidence of compliance to the DNO. This reflects the requirement for the DNO to provide evidence to NGC under revised OC5.

The changes to the compliance procedure in OC5, i.e. moving the requirement from the Generator to the DNO, is reflected in new drafting in DOC5. The new section in DOC5 replicated the Grid Code requirements for compliance testing. The procedures under OC5 and DOC5 provide for a combined procedure between NGC, DNO and Generator to facilitate any tests required. As noted above the compensation mechanism for such test was debated at length in the working group and no explicit compensation mechanism has been drafted in the Grid Code or the D Code. The working group envisaged that test would only be carried out as a last resort and that any compensation would need to be agreed between the parties at the time.

Additional issues

BETTA
Although the main body of the work carried out by the group was in the context of England and Wales the group do not perceive any negative issues with applying the proposed arrangement on a GB basis. Accordingly, the text provided in the report has been updated on a GB basis. The text presented for the D Code also includes consequential BETTA changes.

LEGAs / Derogations
Option 2 is intended to remove the need for a LEGA between NGC and a Generator. The working group believes that the drafting presented achieves this. In most cases it is also expected that option 2 would remove the need for a derogation. In a small number of cases a derogation may still be required, although this will be for NGC and the DNO rather than NGC itself.

The individual derogations that are required would need to be identified and put in place prior to the code becoming effective.

CUSC
The working group noted that the proposed change significantly alters the relationship between NGC and the DNOs. In a number of areas, such as indemnity, the working group believe the provisions in the CUSC should be reviewed should option 2 be taken forward. As a minimum the working group envisage that such a review would cover aspects of indemnification for the DNO against certain NGC actions in respect of a Medium Power Stations and the connection process requirements for DNOs (e.g. CUSC section 6.5).

Conclusion
The working group has concluded that option 2, a relationship where the Grid Code technical requirements are enforced on the DNO by NGC and then on the Generator by the DNO, is the most appropriate solution.

The drafting presented in this paper would allow option 2 to be implemented with minimal impact on other codes.

Recommendation of working group

The working group seeks the GCRP's and DCRP's acceptance of this report as fulfilling the complete requirements of the Terms of Reference.

The working group recommends that the GCRP and DCRP endorse the proposed option 2 as the preferred way forward and that the drafting that has been developed forms the basis of an industry consultation.

Appendix 1: Original Paper to GCRP and DCRP

Grid Code and Distribution Code Review Panels

Technical Requirements for Licence-Exempt Embedded Medium Power Stations By DNOs & National Grid

Background

1. The Department of Trade and Industry (DTI) have raised the limit for medium size power stations (i.e. power stations in the range 50MW to less than 100MW) to be exempt from having a generation licence. Whereas small power stations (less than 50MW) are automatically exempt, Generators planning the installation and operation of a medium power station can now apply to the DTI for an individual licence exemption.

2. Licence-exempt Generators are not required to comply with the Grid Code and hence would not be bound by the Grid Code technical requirements that apply to such medium power stations. In addition, licence-exempt Generators are not compelled to sign the Connection and Use of System Code (CUSC) or the Balancing and Settlement Code (BSC), although they can choose to accede to both these Codes. If a licence-exempt generating station is embedded, then National Grid might not have any contractual relationship with that Generator.

3. In addition to large power stations (100MW and above), the Grid Code includes technical requirements for all directly-connected and embedded medium power stations and these requirements need to be maintained in order to ensure the continued development and operation of a stable and secure transmission system. The current and potential future growth in licence-exempt embedded medium power stations make it important that such stations continue to have these technical capabilities during their lifetime.

4. However, there is no longer a contractual or other mechanism that allows National Grid to apply, and require compliance with, the existing or developing Grid Code technical requirements on licence-exempt embedded medium power stations.

Issues for National Grid

5. For the past two years, National Grid has had discussions with the DTI on the need for licence-exempt embedded medium power stations to continue to be required to meet a minimum set of the Grid Code technical performance requirements. This is to ensure that the security and stability needs of the transmission system are not adversely affected.

6. At a meeting held on 6th February 2003 at the DTI and attended by various industry representatives, it was decided that prior to granting the individual licence exemption order, the DTI would require, as a short-term measure, the Generator to enter into a special bilateral agreement with NGC which includes those minimum technical requirements.

7. At a meeting on 10th April 2003 with the DTI and Ofgem, and attended by NGC and the DNOs, Ofgem and NGC expressed the view that the special bilateral agreement route was only a short-term measure and was not seen as an appropriate long-term solution. It is also understood that this view is held by the Generators.

8. There is, therefore, a need to establish a transparent and binding long-term solution acceptable to the parties concerned and which allows the relevant existing and developing Grid Code technical requirements for licence-exempt embedded medium power stations to be applied, enforced and complied with during the lifetime of the station.

Issues for Distribution Network Operators

9. DNOs are concerned that some of NGC's Grid Code requirements are for the purpose of NGC discharging its statutory and licence conditions for the total system, and are not required for DNOs to meet their own obligations.

10. DNOs have no history of applying such requirements to embedded Generators, and importantly they therefore have:

    a) no legal or licence obligation to do so;

    b) no current expertise in these particular technical specialisms;

    c) no income to support either the technical work required, nor the liabilities and costs arising from it.

11. DNOs believe it is therefore not appropriate to transfer the existing NGC requirements wholesale for DNOs to apply and enforce through either or both of their connection agreements and the Distribution Code.

12. DNOs do recognize some overlap in the Grid Code technical requirements with those existing in the Distribution Code, and believe that these should continue to be applied by DNOs in accordance with existing practice.

Proposed Way Forward

13. Given the industry framework in terms of license responsibilities and existing industry codes, a mechanism needs to be found and agreed that identifies the roles, obligations and responsibilities of all interested parties in meeting the overall objective of placing, enforcing and complying with only relevant technical requirements for licence-exempt embedded medium power stations. The parties are NGC as the total system operator, the DNOs as the host network operators, the embedded Generators as the plant owners, Ofgem as the industry regulator and the DTI as the custodians of the legal and policy requirements for licensing.

14. One possible mechanism would be for the DNOs to require licence-exempt embedded medium Generators via their connection offers/agreements and/or the Distribution Code to have a 'framework' contract in place with NGC. Such a contract would then require compliance with the relevant Grid Code clauses. Other mechanisms may be possible.

15. In order to identify and agree such a mechanism, and to discuss and propose the responsibilities for all parties, it is recommended to establish a joint GCRP/DCRP working group who would be charged with developing proposals and reporting back to the Panels. A draft terms of reference is attached in an appendix.

Recommendations

16. The GCRP/DCRP are invited to:

    a. note the content of this paper

    b. agree the setting up of the proposed joint working group

    c. discuss and agree the proposed working group terms of reference

Appendix

Grid Code and Distribution Code Review Panels

Joint GCRP/DCRP Working Group

Technical requirements for Licence-Exempt Embedded Medium Power Stations

Draft Terms of Reference

1. To identify possible transparent and binding long-term mechanisms which would allow relevant existing and developing Grid Code technical requirements for licence-exempt embedded medium power stations to be applied, enforced and complied with during the lifetime of the station.
2. Possible mechanisms to explore would be for the DNOs to require licence-exempt embedded medium Generators Code to have a 'framework' contract in place with NGC via their connection offers/agreements and/or the Distribution. Such a contract would then require compliance with the relevant Grid Code clauses.
3. To consider other mechanisms as appropriate.
4. The joint GCRP/DCRP working group will report progress and outcome to both Panels.
5. The membership of the joint working group will be drawn from the GCRP/DCRP or their nominated representatives, and Ofgem.
6. The joint working group will aim to complete its work for the GCRP and DCRP meetings that take place on 20 November 2003 and 27 November 2003 respectively.

Appendix 2: Agreed terms of reference

Joint GCRP/DCRP Working Group

Implementation of Technical Requirements for Licence-Exempt Embedded Medium Power Stations

Terms of Reference

Membership

Andy Balkwill	National Grid (Chair)
Sue Newbould	National Grid (Technical Secretary)
Mike Kay	United Utilities
Patrick Hynes	National Grid
Claire Maxim	Powergen
John Norbury	Innogy
Guy Nicholson	Econnect
James Glennie	BWEA
Bridget Morgan	Ofgem (observer)
Nigel Turvey	Western Power
Chris Berry	SP Powersystems
Charlie Zhang	EDF Energy plc

Terms of Reference

7. To explore and identify possible transparent and binding long-term mechanisms, which would allow relevant existing and developing Grid Code technical requirements for licence-exempt embedded medium power stations to be applied, enforced and complied with during the lifetime of the station.

8. To assess the practicality and acceptability of each potential option and also assess high level impact of each potential option on Grid Code, Distribution Code and other key industry documents.

9. To consider other mechanisms as appropriate.

10. The joint GCRP/DCRP working group will report progress and outcome to both Panels.

11. The membership of the joint working group will be drawn from the GCRP/DCRP or their nominated representatives, and Ofgem.

The joint working group will aim to complete its work for the GCRP and DCRP meetings that take place on 20 November 2003 and 27 November 2003 respectively.

Appendix 3: Options discussed by group

Option 1: CUSC>DNO>Generator

The CUSC places obligation on DNO to ensure that Generator complies (either via D Code or DNO Connection Agreement) with certain Grid Code provisions.

- Changes to D Code, Grid Code, CUSC.
- May need change to DNO's connection agreement with the licence exempt generator going forward. DNOs do not have standard connection agreements and so the DNO representatives thought the D Code route was more transparent.

Issues

- Technical requirements reside in Grid Code
- Leaves DNO free to decide which route they use to implement
- Mixes Code and Licence governance
- Potentially requires changes to both G Code & D Code
- CUSC provides different route for dealing with breach and disputes for NGC
- DNO concern regarding lack of resources and expertise available to deal with compliance process
- NGC or its agent could do compliance testing; but would need a mechanism to allow this

Option 2: Grid Code >DNO >Generator

Grid Code places obligation on DNO to ensure that generator complies (either via D Code or DNO Connection Agreement) with certain Grid Code provisions.

- **Changes to D Code and Grid Code (D Code refers to Grid Code).**
- **Avoids unnecessary reference to CUSC (although note possible need for NGC to indemnify DNO if de-energisation of a non-compliant generator is required).**

Issues

- Technical requirements and obligations in Grid Code
- DNO has requirement to comply with Grid Code in its licence
- DNO could argue they should not accept new liabilities (due to costs / expertise?)
- Could be in body of D Code or as separate Engineering Recommendation as annexe to D Code
- Does not involve other Codes / Governance (e.g. CUSC)
- NGC could remain responsible for ensuring compliance (DNO would need to facilitate – provide access for testing etc).
- Remedy for breach? – D Code (or DNO Connection Agreement) would need to provide for the DNO to disconnect a generator breaching the relevant Grid Code provisions? (NGC would need to indemnify the DNO?)

Option 3: NGC > Generator

Direct agreement between NGC and generator (as is currently the case under the DTI requirement as a condition on licence exemption of the generator)

- **BM said this option is not favoured because of its lack of transparency.**
- **Something more durable needed in place of the interim bilateral to enforce the generator to have an agreement with NGC. The DNO's connection agreement would have to say that the generator needs an agreement with NGC. CUSC 6.5.1 covers this to a certain extent – CUSC would need**

changing such that would need to have an agreement with generator if within a certain category.

- **BM was not convinced that this option would remove the need for NGC to apply for a derogation whereas Options 1 and 2 probably would. Would need to amend the bilateral every time there was a change or seek a derogation. If an agreement was not enforced the DTI would consider revoking the licence exemption.**

Issues

- What is the route for requiring generator to sign agreement? (change in BSC definition?)
- DTI/Ofgem see bilateral agreement via licence exemption as a short term fix – this route would establish it as the enduring solution
- Licence exempt generators not keen on signing a bilateral agreement with NGC (additional agreement – legal costs – complexity)
- Requires generator to have 2 agreements (1 with host DNO and 1 with NGC)
- Transparency? – could publish agreement as CUSC exhibit (but would not need to be CUSC signatory)
- Creates new class of agreement between NGC and generator which would need its own governance
- Could make it a condition of connection agreement between DNO and generator that generator would need bilateral agreement with NGC (raises question as to why either DNO or generator would want this, what would remedy be if agreement was not in place)
- Include in licence exemption (current mechanism is seen as temporary by DTI and Ofgem)
- Make class exemption of <100MW (not within our gift)
- Would give direct relationship between NGC and generator and give contractual remedy for breach and disputes

Option 4: CUSC > Supplier > Generator and
Option 7: Grid Code >Supplier > Generator

CUSC (or Grid Code) places obligation on supplier to ensure it only contracts with "Grid Code compliant" generators

- **Post P100 there may not be a supplier.**
- **Contracts between suppliers and generators can change fairly frequently.**

Issues

- Places additional onus on supplier (additional obligations, complexity, audit etc)
- Competitive issues surrounding which generators meet the technical requirements
- Appears to be inferior to Option 1 because supplier has less technical knowledge than DNO.
- Avoids DNO involvement, although would still need connection agreement with them
- If a breach occurs, it is down to the supplier to sort out. – what remedy? DNO's remedy for breach is to disconnect generator. Supplier financially has more hold.
- If supplier has no technical knowledge it puts the onus on the generator to prove they are a "Grid Code compliant" generator – i.e. seek “certification”.
- Generator would come to NGC/3rd party for certificate
- Has contractual teeth between supplier and generator

Option 5: Distribution Code > Generator

Requirements identified in D Code which will apply directly to the embedded generator

- **If obligation sits in D Code then suggests DNO would be responsible for testing, compliance.**
- **No locus for NGC for an issue that is its responsibility under Licence. DNO could change without NGC's agreement, derogation problem.**
- **Change required to D Code.**
- **Would DNO have access to information (confidential to generator's manufacturer).**
- **CB felt it was impracticable from both a technical and resource point of view for the DNO to collect data, run studies, test.**

Issues

- Why would NGC requirements to fulfil its licence obligations be incorporated in D Code when not required for DNO to fulfil their obligations?
- Could present a problem to the DNO if challenged - DNO needing to defend requirement.
- D Code not best placed to view total system requirements
- Only DNOs or Ofgem can change D Code?

Option 6: Review Licence Exemption Criteria

Change to Generator Licence such that 50-100MW are in a licence exempt category which requires them to comply with certain Grid Code conditions.

- **Replaces the need for a bilateral because requirements would be set out in the Class Exemption / Grid Code. However, conditions could not be put in a class exemption because it is cross governance and therefore illegal.**
- **Therefore it is a non-starter to have a set of changing requirements. Once the Grid Code conditions are set they cannot be changed without DTI changing the class exemption and NGC would need derogation.**
- **There is a lack of enforcement.**

Issues

- Effectively extends class exemption to this 50-100MW category
- DTI would have to change legislation (secondary or primary?)
- What route to allow testing, to enforce / remedy breach?
- Who would test compliance
- What would consequences of breach be? Plant is Licence exempt – implies need for plant in category to be Licensed if it can't comply with the technical requirements?

Option 8: Market Solution

No Grid Code requirements on this type of generation.

- **Whoever had the market power had the advantage (could have monopoly in certain area).**
- **Difficulties of creating markets for different attributes. Regulation of market.**
- **Could encourage generator to site itself where it would not impact on the DNO.**

Issues

- NGC contracts with individual providers e.g. NGC contracts with a generator to have a fault ride through capability / frequency response etc.
- Which characteristics should be subject commercial choice by the market participant and which are fundamental requirements for participating in the market?
- SQSS - is maximum loss of infeed of 1320MW still appropriate (SQSS sites under Licence)?
- Who should bear costs of e.g. additional response to cover >1320MW loss – market as a whole, NGC, the user causing the need for the carrying of additional response?
- Markets do not yet exist (e.g. response) so their ability to deliver essential system services are unproven.

New Option 9: Do nothing

- **NGC continues to get derogations. (Ofgem does not like this and stops the DTI going to class exemption for <100MW).**
- **Review 1320MW maximum loss.**
- Grid Code change to allow NGC to not apply Grid Code to licence exempt plant.

New Option 10: Commercial buyout

All developers seek two quotations from EPC contractors or turbine manufacturers: one (Price A) for installation compliant with all applicable new GC requirements; one (Price B) for installation not compliant with the new requirements. If any developer chooses to be not compliant with the new requirements, then he will:

a) pay cost at Price Delta (A-B) to a central fund for not being compliant, or

b) be paid at Price Delta (A-B) from the central fund for being compliant.

The choice of a or b is with the central fund administrator (which can be NGC) and not with the developer.

Rational: 'buyout' is a reasonable option whenever only a fraction of players could not meet certain requirements but most can.

- **Base set of technical criteria is still required.**
- **Difficulty in calculating lifetime system cost.**
- **Would work in a vertically integrated industry.**

Appendix 4: Grid Code requirements for Medium Power Stations

Medium Embedded Power Station Requirements in the Grid Code				
Notes:				
1. This table summarises the requirements in the current Grid Code. It is provided solely for the purposes of discussion at the Grid Code / D Code joint WG on embedded Medium Power Stations. It does not seek to change the existing requirements, in the event of an error the requirements in the Grid Code take precedence.				
2. Where the Grid Code Clause is of a 'higher order' it is assumed that all relevant subordinate clauses are equally applicable i.e. if CC6.3 is listed CC6.3.3 is applicable.				
3. The Grid Code makes no distinction between Licensed and Licence exempt plant.				

GC Clause	Summary	Embedded	Non-embedded	Comments
PC -Planning Code				
PC Scope	Identification of developments on the NGC network. Covers the data required by NGC to plan the system. Applicable to all Generators.	✔	✔	Ref. CUSC 6.5.1 when the Generator is embedded. Medium Power Stations are required to comply with all the relevant sections in PC. Certain data would only be sent in relation to applications, CUSC 6.5.1 needs to be considered, current drafting makes it an initiator for discussions. Drafting needs to reflect that a DNO is responsible for sending information unless the Generator is required to send it pursuant to an application.
PC3.2	In the case of Embedded Power Stations, unless provided otherwise, the provisions apply with regard to the data to be submitted under the PC i.e. each Generator shall provide the data direct to NGC in respect of Embedded Large Power Stations and Embedded Medium Power Stations;	✔		Certain data does not need to be supplied in relation to Embedded Power Stations where these are connected at a voltage level below the voltage level directly connected to the NGC Transmission System except in connection with a CUSC Contract, or unless specifically requested by NGC(PC.A.1.12)

GC Clause	Summary	Embedded	Non-embedded	Comments
PC.4.1 (b)	Requirement for NGC to offer terms, in the case of an embedded generator the relevant agreement is a BEGA under the CUSC.	✔	✔	If an unlicensed generator were to sign the CUSC then they would be required to comply with the PC.
PC.4.2	Overview of the data, if required to supply	✔	✔	Summarises the requirements, no explicit obligations.
PC.4.3 onwards	Provision of data	✔	✔	There are certain clauses the exclude certain embedded Medium Power Stations e.g. PC.A.5.1.2. -at a voltage level below that of connection.
				The appendices detail more exactly who needs to provide what. This possibly interacts with the Medium Power Station Working Group. More detail on DRC requirements have been supplied by EPSWG, to be updated and added on an attached sheet.
CC –Connection Conditions				
CC Scope	Generators (other than those which only have Embedded Small Power Stations)	✔	✔	If required to comply with the Grid Code through a BEGA then a Generator is required to comply directly with all the relevant Connection Conditions i.e. signed up to the CUSC.
CC.4	Reference to the procedure for connection – Issue of Operational Notifications	✔	✔	Reference CUSC section 3 part 1A
CC.5	Summary of provisions contained in the BCA or BEGA and details for the exchange of information.	✔	✔	There are some exclusion relating to Embedded Generators. These are mainly related to directly connected issues such as safety rules, operational diagrams etc. This section summarises data submitted pursuant to the terms of a BCA/ BEGA / Construction Agreement, parties not signed onto the CUSC will not have these and therefore drafting will need to reflect the D Code route.

GC Clause	Summary	Embedded	Non-embedded	Comments
CC.6.1.5 (b)	Transmission System performance including voltage waveform quality (6.1.5 withstanding Harmonics and Phase Unbalance)		✔	CC6.1.5 (b) Linked to embedded plant through CC6.3.10. CC6.1.5 (a) There is an obligation on DNOs to ensure users of their systems do not cause them to exceed limits. CC6.1.6 DNOs impose P28 themselves through the D Code. CC6.1.7 only interested in the connection point, DNOs may 'absorb' excess, requirements imposed through DNO.
CC.6.3	General Generating Unit Requirements. This section sets out the technical and design criteria and performance requirements for Generating Units (whether directly connected to the NGC Transmission System or Embedded) which each Generator must ensure are complied with in relation to its Generating Units.	✔	✔	Grid Code requires compliance with 6.3.1 - 6.3.14. G75 recommends compliance with 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.6, 6.3.7, 6.3.8, 6.3.9, 6.3.10, 6.3.11, 6.3.12, 6.3.14 (BM unit only)
CC.6.5	Communications Plant. In order to ensure control of the NGC Transmission System, telecommunications between Users and NGC must, **if required by NGC**, be established in accordance with the requirements for this section.	✔	✔	In general, it is more likely that NGC would require these if the party were directly connected or active in the BM. Although NGC may require these if a User was though to have a significant impact on the Transmission System.
CC6.6	System Monitoring	✔	✔	Refers to NGC transmission system, unrealistic to apply to embedded units. Suggest drafting to apply to directly connected units only.
CC7	Site Related Condition		✔	Directly connected issues only
CC8	Ancillary Services	✔	✔	Requirements for capability, covers mandatory, agreed and commercial ancillary services. Needs to line up with BC3 - change BC3 to allow NGC to despatch medium PSs.

GC Clause	Summary	Embedded	Non-embedded	Comments
OC1 -Demand Forecasts				
OC Scope	Applies to Generators	✔	✔	Applies to Medium Power Stations (whether embedded or not), generators themselves to supply the data. Clarify - should apply to all embedded who do not send PNs
OC1.4	Data requirements - Operational Planning Phase (w8 to y5)	✔	✔	
OC1.5	Data required by NGC in the Programming, Control and Post Control Phases.	✔	✔	MW schedules on a half hourly basis, only if reasonably required. Three timescales (2-8 week, 2-12 days, and day ahead). Need to discuss adding 2-52 wk (or year ahead + updates) generator expected running if reasonably required submission from Oct / Sep -required to forecast demand in the group -this is set against relaxing the BCs requirement. Sync / desynch time may also be required at certain sites - more an OC7 type query?
OC2 –Operational Planning Data				
OC2 Scope	Excludes Generators who only have embedded Medium Power Station		✔	OC2 covers planning 'Genset' outages, Transmission plant outages and coordination of User outages. Medium Power stations are generally excluded due to the use of Gensets. NGC provides information on Transmission plant outages to non Embedded Power Stations. OC2 assume no directly connected Small or Medium Generators. If a Medium Power Station were to connect to the Transmission System we would need consider how we coordinate outages. Draft to apply to all directly connected units.
OC2.4.1.3	Planning of Transmission System Outages		✔	NGC will supply directly connected generators with NGC Transmission outage information. Generators will supply information on apparatus outages.
OC5 Testing and Monitoring				

GC Clause	Summary	Embedded	Non-embedded	Comments
OC5.3 Scope	Includes Generators	✔	✔	Mainly concerned with compliance against CCs, verification that BM Units are available as declared and Ancillary Services are provided / available as agreed. In addressing Medium Power Stations OC5 assumes that all generators submit PNs as per BC1 - need to include some provision for possibly testing no BMUs. Draft -in the case of embedded MPSs this will normally be achieved solely through data / test submissions rather than on site testing - seek assurance - enabler required if suspect non-compliance.
OC5.4	Monitoring	✔	✔	
OC5.5	Testing	✔	✔	If the set were not a BMU then need to clarify how a test would be carried out ref. comments on OC5.3.
OC5.6	Dispute Resolution	✔	✔	
OC5.7	Black Start		✔	We don't currently envisage having a black start with Medium Power Stations - could draft this out.
OC6 Demand Control				
OC6 Scope	Includes Generators	✔	✔	Very limited involvement for Generation.
OC6.6.7 (a)/(b)	Directly connected generators can agree with NGC that they are disconnected if subjected to low frequency		✔	
OC6.6.7 (a)/(c)	Embedded generators to agree with the relevant User if they can disconnect when subject to low frequency- NGC to be notified.	✔		Only covers operation outside the required CC capabilities CC6.3.13.
OC7 Operational Liaison				
OC7 Scope	Excludes Generators who only have embedded Medium Power Stations		✔	Medium Power Stations are not covered by IETs 7.5

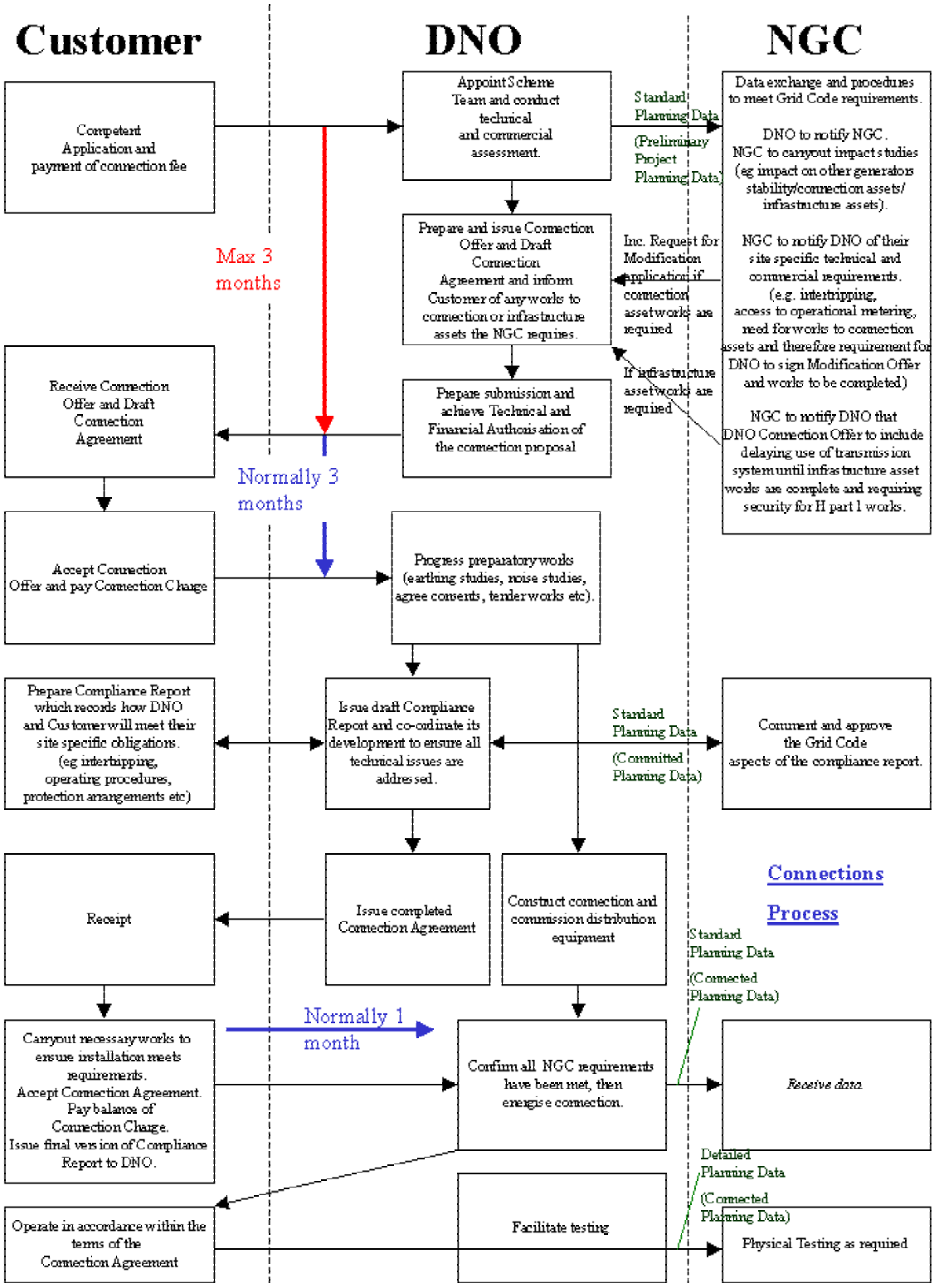
GC Clause	Summary	Embedded	Non-embedded	Comments
OC7.4.5	Notification of Operations between directly connected Users		✔	Network Operators would inform NGC of operations on its system related to embedded generators
OC7.4.6	Notification of Events between directly connected Users		✔	Network Operators would inform NGC of events on its system related to embedded generators
OC7.4.7	Reporting on significant incidents between directly connected Users		✔	Network Operators would liase with NGC on significant Incidents linked to embedded generators on its system
OC7.4.8	Issue of system warnings		✔	NGC will issues to all Users i.e. only CUSC signatories - those people we have a contract and hence detail about.
OC8 Safety Coordination				
OC8 Scope	Includes Generators		✔	Limited to directly connected Medium Power Stations, scope does not make this explicit
OC8.4	Procedure for Safety Coordination		✔	
OC8.5	Safety precautions on HV apparatus		✔	
OC8.6	Testing		✔	
OC8.7	Emergencies		✔	
OC8.8	Loss of integrity of Safety Precautions		✔	
OC8.9	Safety log		✔	
OC9 Contingency Planning				
OC9 Scope	Includes Generators	✔	✔	Black Start Capability limited to Gensets, details in CUSC agreements. Other Stations are required to comply with the general provisions. Draft to make all liaison with medium PSs through the DNO.
OC9.4	Black Start procedure - overview of the process for complete or partial Black Start	✔	✔	May be involved in the LJRP
OC9.5	Resynchronisation of Desynchronised islands	✔	✔	Uses mainly Gensets, but there are references to generators. Look for all liaison through the DNO.
OC9.6	Joint System Incident procedure		✔	OC9.6.1 (a) excludes Medium Embedded Power Stations.

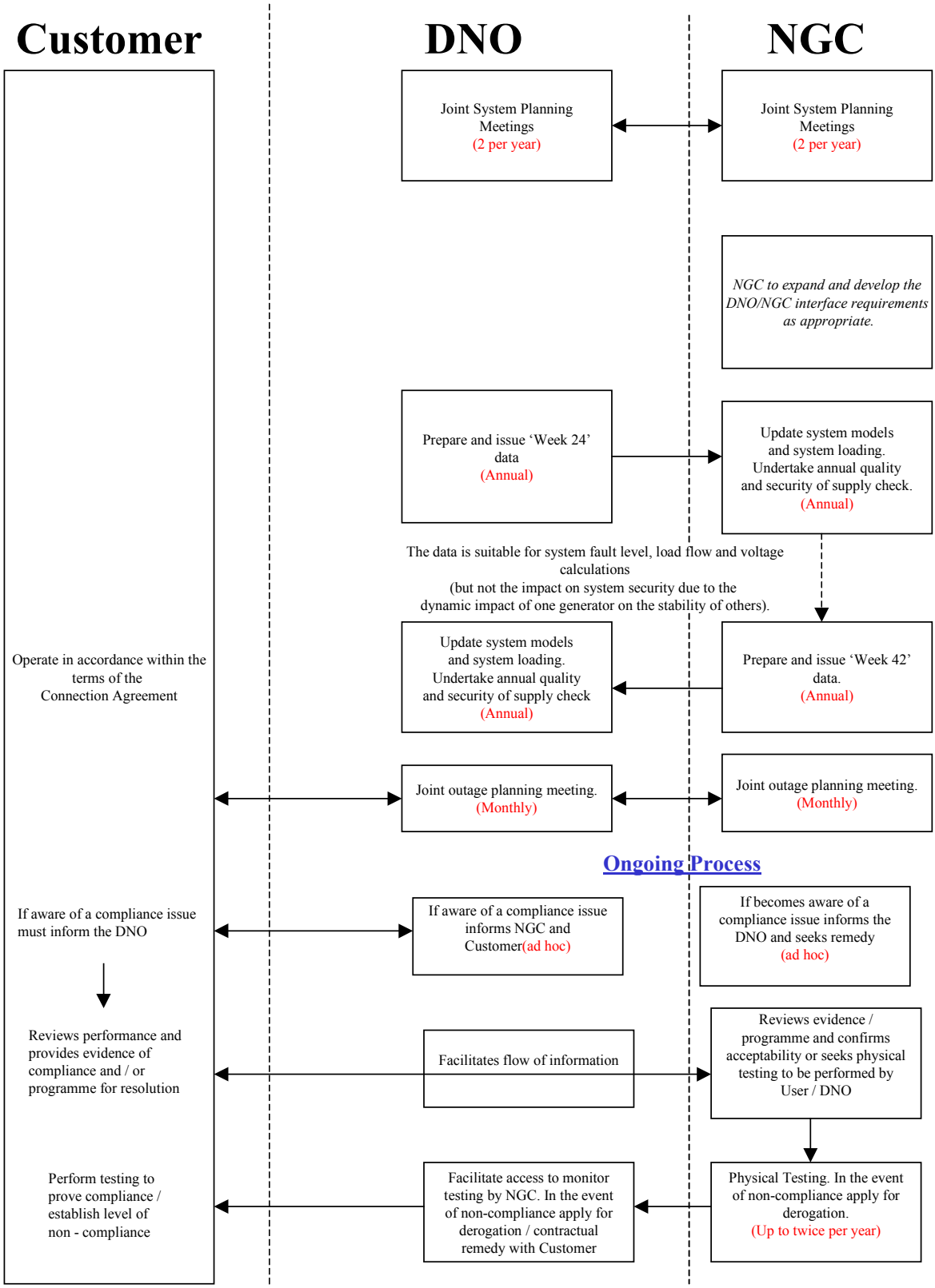
GC Clause	Summary	Embedded	Non-embedded	Comments
OC10 Event Information Supply				
OC10.3	Scope excludes Small / Medium Embedded Power Stations		✔	Network Operators would liase with Embedded Small / Medium Power Stations
OC11 Numbering and Nomenclature				
OC11.3	The scope includes generators, but this is limited to those that have a common site with NGC.		✔	
OC12 System Test				
OC12	Covers system tests and applies to all generators	✔	✔	In general most liaison with embedded Small / Medium Power Stations would be through the Network Operator.
BC1 Pre Gate Closure Process				
BC1	Applies to all BM participants (person responsible for a BM unit). Physical Notifications are required from all BMUs at Medium Power Stations.	✔	✔	ref. BC1.3 and BC1.4.2 (a) (ii). Interaction with OC1. Suggest that embedded MPSs only need to comply where reasonably required. To back this up we would require improved OC1 data flow - option to request 2-52wk data and sync / design times.
BC2 Post Gate Closure Process				
BC2	Applies to all BM participants (person responsible for a BM unit). Covers the real time operation of the BM.	✔	✔	
BC3 Frequency Control Process				

GC Clause	Summary	Embedded	Non-embedded	Comments
BC3 Scope	Limited to Gensets and Ancillary Service providers			If an embedded generator provided 'other Ancillary services' it would apply. In these circumstances we would have a CUSC contract. BC3 to be drafted changed to allow all generators to provide services.

Appendix 5: Customer / DNO / NGC Interface Mapping

Note, this Appendix was used by the working group to aid their discussions. It does not necessarily accurately reflect current or any potential future arrangements under the CUSC.




Customer
DNO
NGC
Joint System Planning Meetings (2 per year)
Joint System Planning Meetings (2 per year)
NGC to expand and develop the DNO/NGC interface requirements as appropriate.
Prepare and issue 'Week 24' data (Annual)
Update system models and system loading. Undertake annual quality and security of supply check. (Annual)
The data is suitable for system fault level, load flow and voltage calculations (but not the impact on system security due to the dynamic impact of one generator on the stability of others).
Operate in accordance within the terms of the Connection Agreement
Update system models and system loading. Undertake annual quality and security of supply check (Annual)
Prepare and issue 'Week 42' data. (Annual)
Joint outage planning meeting. (Monthly)
Joint outage planning meeting. (Monthly)
Ongoing Process
If aware of a compliance issue must inform the DNO
If aware of a compliance issue informs NGC and Customer(ad hoc)
If becomes aware of a compliance issue informs the DNO and seeks remedy (ad hoc)
Reviews performance and provides evidence of compliance and / or programme for resolution
Facilitates flow of information
Reviews evidence / programme and confirms acceptability or seeks physical testing to be performed by User / DNO
Perform testing to prove compliance / establish level of non - compliance
Facilitate access to monitor testing by NGC. In the event of non-compliance apply for derogation / contractual remedy with Customer
Physical Testing. In the event of non-compliance apply for derogation. (Up to twice per year)

Appendix 6: Gantt chart of connections process

Note, this Appendix was used by the working group to aid their discussions. It does not necessarily accurately reflect current or any potential future arrangements under the CUSC

Task	Description	Responsibility	Duration	Dependency	Month 1				Month 2				Month 3			
1	Check application	DNO	5 days													
2	Appoint 'scheme team' agree programme of work, actions and milestone dates	DNO	1 day	1												
3[1]	Notify NGC of application	DNO	1 day	2												
4	High level impact assessment ('materiality check').	NGC	30 days	3												
5	System design and analysis	DNO	30 days	2												
6	Technically approve connection option	DNO	1 day	4, 5												
7	Detailed scheme development	DNO	21 days	6												
8	Budget costing	DNO	12 days	7 (– 6 days)												
9	Company financial sanction	DNO	16 days	8 (– 8 days)												
10[2]	Notify NGC of connection option	DNO	1 day	6												
11	More detailed impact assessment based on connection option.	NGC	30 days	7												
12	Prepare Connection Offer & draft Connection Agreement	DNO	9 days	7												
13	Finalise Connection Offer & draft Connection Agreement	DNO	9 days	11												
14	Issue Connection Offer & draft Connection Agreement	DNO	1 day	10, 13												

Outline Gantt chart showing activities between receipt of application from Customer and issue of Connection Offer.
The DNO licence requires the offer to be issued within 3 months. The clock starts on receipt of all necessary information and application fee.

[1] DNO to provide following data:
Connection Site
Generating Unit Technical Data and DNO network data of the connection and circuits to GSP
Indicative details of connection to distribution system (eg km, voltage and to which circuit on existing GSP)

[2] DNO to provide following data:
Single line diagram of connection
Any amendments to data previously supplied

Appendix 7: Grid Code drafting to support option 2

LEEMPS DRAFTING CHANGES SHOWN IN TRACK CHANGES FROM ISSUE 3 BETTA GO ACTIVE TEXT

GLOSSARY AND DEFINITIONS REVISIONS

Embedded Development Agreement	An agreement entered into between a **Network Operator** and an **Embedded Person**, identifying the relevant site of connection to the **Network Operator's System** and setting out other site specific details in relation to that use of the **Network Operator's System**.
Embedded Person	The party responsible for a **Medium Power Station** or **DC Converter Station** connected to or proposed to be connected to a **Network Operator's System** not subject to a **Bilateral Agreement**.
Embedded Development	Has the meaning set out in PC.4.4.3(a)
Completion Date	Has the meaning set out in the **Bilateral Agreement** with each **User** to that term or in the absence of that term to such other term reflecting the date when a **User** is expected to connect to or start using the **GB Transmission System**. In the case of an **Embedded Medium Power Station** or **Embedded DC Converter Station** having a similar meaning in relation to the **Network Operator's System** as set out in the **Embedded Development Agreement**.

……
……

PLANNING CODE REVISIONS

PC.3.2 In the case of **Embedded Power Stations** and **Embedded DC Converters**, unless provided otherwise, the following provisions apply with regard to the provision of data under this **PC**:

(a) each **Generator** shall provide the data direct to **NGC** in respect of (i) **Embedded Large Power Stations,** (ii) **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and (iii) **Embedded Small Power Stations** which form part of a **Cascade Hydro Scheme;**

(b) each **DC Converter** owner shall provide the data directly to **NGC** in respect of **Embedded DC Converter Stations**;

(c) each **Network Operator** shall provide the data to **NGC** in respect of each **Embedded Person** within its **System**;

(dc) although data is not normally required specifically on **Embedded Small Power Stations** or on **Embedded** installations of direct current converters which do not form a **DC Converter Station** under this **PC**, each **Network Operator** in whose **System** they are **Embedded** should provide the data (contained in the Appendix) to **NGC** in respect of **Embedded Small Power Stations** or **Embedded** installations of direct current converters which do not form a **DC Converter Station** if:

(i) it falls to be supplied pursuant to the application for a **CUSC Contract** or in the **Statement of Readiness** to be supplied in connection with a **Bilateral Agreement** and/or **Construction Agreement,** by the **Network Operator**; or

(ii) it is specifically requested by **NGC** in the circumstances provided for under this **PC**.

PC3.3 Certain data does not normally need to be provided in respect of certain **Embedded Power Stations** or **Embedded DC Converter Stations**, as provided in PC.A.1.12.

In summary, **Network Operators** are required to supply the following data in respect of **Embedded Medium Power Stations** or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** connected, or is proposed to be connected, within such **Network Operator's System**:

PC.A.2.5.6
PC.A.3.1.5
PC.A.3.2.2
PC.A.3.3.1
PC.A.3.4.1
PC.A.3.4.2
PC.A.5.2.2
PC.A.5.3.2
PC.A.5.4.
PC.A.5.5.1
PC.A.5.6.

……

PC.4.1 Pursuant to Condition C11 of **NGC's Transmission Licence**, the means by which **Users** and proposed **Users** of the **GB Transmission System** are able to assess opportunities for connecting to, and using, the **GB Transmission System** comprise two distinct parts, namely:

(a) a statement, prepared by **NGC** under its **Transmission Licence**, showing for each of the seven succeeding **Financial Years**, the opportunities available for

connecting to and using the **GB Transmission System** and indicating those parts of the **GB Transmission System** most suited to new connections and transport of further quantities of electricity (the "**Seven Year Statement**"); and

(b) an offer, in accordance with its **Transmission Licence**, by **NGC** to enter into a **CUSC Contract** for connection to (or, in the case of **Embedded Large Power Stations**, **Embedded Medium Power Stations**, ~~and~~ **Embedded DC Converter Stations** and **Embedded Small Power Stations** , use of) the **GB Transmission System**. A **Bilateral Agreement** is to be entered into for every **Connection Site** (and for certain **Embedded Power Stations** and for **Embedded DC Converter Stations**, as explained above) within the first two of the following categories and the existing **Bilateral Agreement** may be required to be varied in the case of the third category:

(i) existing **Connection Sites** (and for certain **Embedded Power Stations**, as detailed above) as at the **Transfer Date;**

(ii) new **Connection Sites** (and for certain **Embedded Power Stations** and for **Embedded DC Converter Stations**, as detailed above) with effect from the **Transfer Date**;

(iii) a **Modification** at a **Connection Site** (or in relation to the connection of certain **Embedded Power Stations** and for **Embedded DC Converter Stations**, ~~as detailed above~~ whether or not the subject of a **Bilateral Agreement**) (whether such **Connection Site** or connection exists on the **Transfer Date** or ~~are~~ is new thereafter) with effect from the **Transfer Date**.

In this **PC**, unless the context otherwise requires, "connection" means any of these 3 categories.

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PC.4.3.1 Seven Year Statement

To enable the **Seven Year Statement** to be prepared, each **User** is required to submit to **NGC** (subject to the provisions relating to **Embedded Power Stations** and **Embedded DC Converter Stations** in PC.3.2) both the **Standard Planning Data** and the **Detailed Planning Data** as listed in parts I and 2 of the Appendix. This data should be submitted in calendar week 24 of each year (although **Network Operators** may delay the submission of data (other than that to be submitted pursuant to PC.3.2(c) and PC.3.2(d)) until calendar week 28) and should cover each of the seven succeeding **Financial Years** (and in certain instances, the current year). Where, from the date of one submission to another,

there is no change in the data (or in some of the data) to be submitted, instead of re-submitting the data, a **User** may submit a written statement that there has been no change from the data (or in some of the data) submitted the previous time. In addition, **NGC** will also use the **Transmission Entry Capacity** and **Connection Entry Capacity** data from the **CUSC Contract**, and any data submitted by **Network Operators** in relation to an **Embedded Medium Power Station** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**, in the preparation of the **Seven Year Statement** and to that extent the data will not be treated as confidential.

PC.4.4 Offer of Terms for connection

PC.4.4.1 **CUSC Contract** – Data Requirements/Offer Timing

The completed application form for a **CUSC Contract** to be submitted by a **User** when making an application for a **CUSC Contract** will include:

(a) a description of the **Plant** and/or **Apparatus** to be connected to the **GB Transmission System** or of the **Modification** relating to the **User's Plant** and/or **Apparatus** already connected to the **GB Transmission System** or, as the case may be, of the proposed new connection or **Modification** to the connection within the **User System** of the **User**, each of which shall be termed a "**User Development**" in the **PC**;

(b) the relevant **Standard Planning Data** as listed in Part 1 of the Appendix; and

(c) the desired **Completion Date** of the proposed **User Development**.

(d) the desired **Connection Entry Capacity** and **Transmission Entry Capacity**.

The completed application form for a **CUSC Contract** will be sent to **NGC** as more particularly provided in the application form.

PC.4.4.2 Any offer of a **CUSC Contract** will provide that it must be accepted by the applicant **User** within the period stated in the offer, after which the offer automatically lapses. Acceptance of the offer renders the **GB Transmission System** works relating to that **User Development**, reflected in the offer, committed and binds both parties to the terms of the offer. Within 28 days (or such longer period as **NGC** may agree in any particular case) of acceptance of the offer the **User** shall supply the **Detailed Planning Data** pertaining to the **User Development** as listed in Part 2 of the Appendix.

PC.4.4.3 **Embedded Development Agreement** – Data Requirements

The **Network Operator** shall submit the following data in relation to an **Embedded Medium Power Station** or **Embedded DC Converter Station** not subject to, or proposed to be subject to, a **Bilateral Agreement** as soon as reasonably practicable after receipt of an application from an **Embedded Person** to connect to its **System**:

(a) details of the proposed new connection or variation (having a similar effect on the **Network Operator's System** as a **Modification** would have on the **GB Transmission System**) to the connection within the **Network Operator's System**, each of which shall be termed an "**Embedded Development**" in the **PC** (where a **User Development** has an impact on the **Network Operator's System** details shall be supplied in accordance with PC.4.4 and PC.4.5);

(b) the relevant **Standard Planning Data** as listed in Part 1 of the Appendix;

(c) the proposed completion date (having a similar meaning in relation to the **Network Operator's System** as **Completion Date** would have in relation to the **GB Transmission System**) of the **Embedded Development**; and

(d) upon the request of **NGC**, the relevant **Detailed Planning Data** as listed in Part 2 of the Appendix.

PC.4.4.4 Within 28 days (or such longer period as **NGC** may agree in any particular case) of entry into the **Embedded Development Agreement** the **Network Operator** shall supply the **Detailed Planning Data** pertaining to the **Embedded Development** as listed in Part 2 of the Appendix.

……

PC.4.5.3 To enable **NGC** to carry out any necessary detailed system studies, the relevant **Network Operator** may, at the request of **NGC**, be required to provide some or all of the **Detailed Planning Data** listed in Part 2 of the Appendix in advance of the normal timescale referred in PC.4.4.4 provided that **NGC** can reasonably demonstrate that it is relevant and necessary.

……

PC.5.2 At the time the **User** applies for a **CUSC Contract** but before an offer is made and accepted by the applicant **User**, the data relating to the proposed **User Development** will be considered as **Preliminary Project Planning Data**. Data relating to an **Embedded Development** provided by a **Network Operator** in accordance with PC.4.4.3, and PC.4.4.4 if requested, will be considered as **Preliminary Project Planning Data**. All such data

~~This data~~ will be treated as confidential within the scope of the provisions relating to confidentiality in the **CUSC**.

……

PC.5.4 Once the offer for a **CUSC Contract** is accepted, the data relating to the **User Development** already submitted as **Preliminary Project Planning Data**, and subsequent data required by **NGC** under this **PC**, will become **Committed Project Planning Data**. Once an **Embedded Person** has entered into an **Embedded Development Agreement**, as notified to **NGC** by the **Network Operator**, the data relating to the **Embedded Development** already submitted as **Preliminary Project Planning Data**, and subsequent data required by **NGC** under the **PC**, will become **Committed Project Planning Data**. Such ~~This~~ data, together with **Connection Entry Capacity** and **Transmission Entry Capacity** data from the **CUSC Contract** and other data held by **NGC** relating to the **GB Transmission System** will form the background against which new applications by any **User** will be considered and against which planning of the **GB Transmission System** will be undertaken. Accordingly, **Committed Project Planning Data**, **Connection Entry Capacity** and **Transmission Entry Capacity** data will not be treated as confidential to the extent that **NGC**:

……

……

PC.5.5 The **PC** requires that, at the time that a **Statement of Readiness** is submitted under the **Bilateral Agreement** and/or **Construction Agreement**, any estimated values assumed for planning purposes are confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated forecasts for forecast data items such as **Demand**. In the case of an **Embedded Development** the relevant **Network Operator** will update any estimated values assumed for planning purposes with validated actual values as soon as soon as reasonably practicable after energisation. This data is then termed **Connected Planning Data**.

……

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PC.A.1.2 (a) Planning data submissions by **Users** shall be:

(i) with respect to each of the seven succeeding **Financial Years** (other than in the case of **Registered Data** which will reflect the current position and data relating to **Demand** forecasts which relates also to the current year);

(ii) provided by **Users** in connection with a **CUSC Contract** (PC.4.1, PC.4.4 and PC.4.5 refer); ~~and~~

(iii) provided by **Users** on a routine annual basis in calendar week 24 of each year to maintain an up-to-date data bank (although **Network Operators** may delay the submission until calendar week 28). Where from the date of one annual submission to another there is no change in the data (or in some of the data) to be submitted, instead of re-submitting the data, a **User** may submit a written statement that there has been no change from the data (or some of the data) submitted the previous time; and ~~.~~

(iv) provided by **Network Operators** in connection with **Embedded Developments** (PC.4.4 refers).

(b) Where there is any change (or anticipated change) in **Committed Project Planning Data** or a significant change in **Connected Planning Data** in the category of **Forecast Data** or any change (or anticipated change) in **Connected Planning Data** in the categories of **Registered Data** or **Estimated Registered Data** supplied to **NGC** under the **PC**, notwithstanding that the change may subsequently be notified to **NGC** under the **PC** as part of the routine annual update of data (or that the change may be a **Modification** under the **CUSC**), the **User** shall, subject to PC.A.3.2.3 and PC.A.3.2.4, notify **NGC** in writing without delay.

(c) The notification of the change will be in the form required under this **PC** in relation to the supply of that data and will also contain the following information:

(i) the time and date at which the change became, or is expected to become, effective;

(ii) if the change is only temporary, an estimate of the time and date at which the data will revert to the previous registered form.

(d) The routine annual update of data, referred to in (a)(iii) above, need not be submitted in respect of **Small Power Stations** or **Embedded** installations of direct current converters which do not form a **DC Converter Station** (except as provided in PC.3.2(~~c~~d)), or unless specifically requested by **NGC**, or unless otherwise specifically provided.

……..

PC.A.1.4 The data requirements listed in this Appendix are subdivided into the following three parts:

(a) **Standard Planning Data**

This data (as listed in Part 1 of the Appendix) is first to be provided by a **User** at the time of an application for a

CUSC Contract or in accordance with PC.4.4.3. It comprises data which is expected normally to be sufficient for **NGC** to investigate the impact on the **GB Transmission System** of any **User Development** or **Embedded Development**. **Users** should note that the term **Standard Planning Data** also includes the information referred to in PC.4.4.1.(a) and PC.4.4.3.(a).

(b) **Detailed Planning Data**

This data (as listed in Part 2 of the Appendix) is usually first to be provided by the **User** within 28 days (or such longer period as **NGC** may agree in any particular case) of the offer for a **CUSC Contract**, being accepted by the **User**. In the case of an **Embedded Development** this data (as listed in Part 2 of the Appendix) is usually first to be provided by the relevant **Network Operator** within 28 days (or such longer period as **NGC** may agree in any particular case) of entry into the **Embedded Development Agreement**. It comprises additional, more detailed, data not normally expected to be required by **NGC** to investigate the impact on the **GB Transmission System** of any **User Development** associated with an application by the **User** for a **CUSC** Contract or **Embedded Development Agreement**. **Users**, and **Network Operators** in respect of **Embedded Developments**, should note that, although not needed within 28 days of the offer or entry into the **Embedded Development Agreement**, as the case may be, the term **Detailed Planning Data** also includes **Operation Diagrams** and **Site Common Drawings** produced in accordance with the **CC.**

The **User** may, however, be required by **NGC** to provide the **Detailed Planning Data** in advance of the normal timescale before **NGC** can make an offer for a **CUSC Contract**, as explained in PC.4.5.

(c) **Network** Data

The data requirements for **NGC** in this Appendix are in Part 3.

……..

PC.A.1.8 The data supplied under PC.A.3.3.1, although in the nature of **Registered Data**, is only supplied either upon application for a **CUSC Contract**, or in accordance with PC.4.4.3, and therefore does not fall to be **Registered Data**, but is **Estimated Registered Data**.

……

PC.A.2.1.1 Each **User**, whether connected directly via an existing **Connection Point** to the **GB Transmission System,** or seeking such a direct

connection, shall provide **NGC** with data on its **User System** which relates to the **Connection Site** and/or which may have a system effect on the performance of the **GB Transmission System**. Such data, current and forecast, is specified in PC.A.2.2 to PC.A.2.5. In addition each **Generator** in respect of its ~~with~~ **Embedded Large Power Stations** ~~or~~and its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** within its **System** not subject to a **Bilateral Agreement**, connected to the **Subtransmission System,** shall provide **NGC** with fault infeed data as specified in PC.A.2.5.5, and each **DC Converter** owner with **Embedded DC Converter Stations** subject to a **Bilateral Agreement**, or **Network Operator** in the case of **Embedded DC Converter Stations** without a **Bilateral Agreement**, connected to the **Subtransmission System** shall provide **NGC** with fault infeed data specified in PC.A.2.5.6.

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PC.A.2.1.3 Although not itemised here, each **User** with an existing or proposed **Embedded Small Power Station** or **Embedded DC Converter Station** with a **Registered Capacity** of less than 100MW or an **Embedded** installation of direct current converters which does not form a **DC Converter Station** or **Embedded Medium Power Station** in its **User System** may, at **NGC's** reasonable discretion, be required to provide additional details relating to the **User's System** between the **Connection Site** and the existing or proposed **Embedded Small Power Station** ~~or,~~ **Embedded Medium Power Station** or **Embedded DC Converter Station** or **Embedded** installation of direct current converters which does not form a **DC Converter Station**.

……..

PC.A.2.5.2 **Network Operators** and **Non-Embedded Customers** are required to submit data in accordance with PC.A.2.5.4. **Generators** ~~and~~, **DC Converter Station owners** and **Network Operators**, in respect of **Embedded Medium Power Stations** and **Embedded DC Converter Stations** within their **Systems** not subject to a **Bilateral Agreement**, are required to submit data in accordance with PC.A.2.5.5.

……..

PC.A.2.5.5 Data from **Generators** ~~and~~, **DC Converter Station** owners and from **Network Operators** in respect of **Embedded Medium Power Stations** within their **Systems** not subject to a **Bilateral Agreement**

PC.A.2.5.5.1 For each **Generating Unit** with one or more associated **Unit Transformers**, the **Generator**, or the **Network Operator** in respect

of **Embedded Medium Power Stations** and **DC Converter Stations** within its **System** not subject to a **Bilateral Agreement**, is required to provide values for the contribution of the **Power Station Auxiliaries** (including **Auxiliary Gas Turbines** or **Auxiliary Diesel Engines**) to the fault current flowing through the **Unit Transformer(s)**.

The data items listed under the following parts of PC.A.2.5.6(a) should be provided:-

(i), (ii) and (v);

(iii) if the associated **Generating Unit** step-up transformer can supply zero phase sequence current from the **Generating Unit** side to the **GB Transmission System;**

(iv) if the value is not 1.0 p.u;

and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c) - (f), and with the following parts of this PC.A.2.5.5.

……..

PC.A.3.1.2 (a) Each **Generator** and **DC Converter Station** owner ~~with an~~in respect of its existing, or proposed, **Embedded Large Power Stations** or **Embedded DC Converter Station** and~~/or an **Embedded Medium Power Station**~~ its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** or **Embedded DC Converter Station** within its **System** not subject to a **Bilateral Agreement**, in each case connected to the **Subtransmission** ~~connected to the **Sub Transmission** **~~ **System**, shall provide **NGC** with data relating to that **Power Station** or **DC Converter Station,** both current and forecast, as specified in PC.A.3.2 to PC.A.3.4.

……

PC.A.3.1.4 (a) PC.A.4.2.4(b) and PC.A.4.3.2(a) explain that the forecast **Demand** submitted by each **Network Operator** must be net of the output of all **Small Power Stations** and **Medium Power Stations** and **Customer Generating Plant** and all installations of direct current converters which do not form a **DC Converter Station, Embedded** within that **Network Operator's System**. The **Network Operator** must inform **NGC** of the number of such **Embedded Power Stations** and such **Embedded** installations of direct current converters (including the

number of **Generating Units** or **Power Park Modules** or **DC Converters**) together with their summated capacity.

(b) On receipt of this data, the **Network Operator** or **Generator** ~~(if the data relates to **Power Stations** referred to in PC.A.3.1.2)~~ may be further required, at **NGC's** reasonable discretion, to provide details of **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and **Embedded** installations of direct current converters which do not form a **DC Converter Station**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4. Such requirement would arise where **NGC** reasonably considers that the collective effect of a number of such **Embedded Power Stations** and **Customer Generating Plants** and **Embedded** installations of direct current converters may have a significant system effect on the **GB Transmission System**.

……

CCGT Units and **DC Converters**

PC.A.3.1.5 Where **Generating Units**, which term includes **CCGT Units** and **Power Park Modules**, and **DC Converters** are connected to the **GB Transmission System** via a busbar arrangement which is or is expected to be operated in separate sections, the section of busbar to which each **Generating Unit**, **DC Converter** or **Power Park Module** is connected is to be identified in the submission.

……..

PC.A.3.3.1 The following information is required to facilitate an early assessment, by **NGC**, of the need for more detailed studies;

(a) for all **Generating Units (excluding Power Park Units) and Power Park Modules**:

Rated MVA
Rated MW;

(b) for each **Synchronous Generating Unit**:

Short circuit ratio
Inertia constant (for whole machine), MWsecs/MVA;

(c) for each **Synchronous Generating Unit** step-up transformer:

Rated MVA
Positive sequence reactance (at max, min and nominal tap).

(d) for each **DC Converter** at a **DC Converter Station** or **DC Converter** connecting a **Power Park Module**

DC Converter type (e.g. current/voltage sourced)
Rated MW per pole for import and export
Number of poles and pole arrangement
Rated DC voltage/pole (kV)
Return path arrangement
Remote AC connection arrangement

(e) for each type of **Power Park Unit** in a **Power Park Module** not connected to the **Total System** by a **DC Converter**:

Rated MVA
Rated MW
Rated terminal voltage
Inertia constant, (MWsec/MVA)
Additionally, for **Power Park Units** that are squirrel-cage or doubly-fed induction generators driven by wind turbines:
- Stator reactance.
- Magnetising reactance.
- Rotor resistance (at rated running)
- Rotor reactance (at rated running)
- The generator rotor speed range (minimum and maximum speeds in RPM) (for doubly-fed induction generators only)
- Converter MVA rating (for doubly-fed induction generators only)

For a **Power Park Unit** consisting of a synchronous machine in combination with a back-to-back **DC Converter,** or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **NGC** in accordance with PC.A.7.

This information should only be given in the data supplied ~~with the application for a **CUSC Contract** (if appropriate for any variation), as the case may be~~in accordance with PC.4.4 and PC.4.5.

……..

PC.A.5.1.2 Each **Generator**, ~~with~~ in respect of its existing, or proposed, **Embedded Large Power Stations** and its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** within its **System** not subject to a **Bilateral Agreement** shall provide **NGC** with data relating to each of those **Large Power Stations** and~~/or~~ **Medium Power Stations**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3 and PC.A.5.4 as applicable. Each **DC Converter Station** owner, or **Network Operator** in the case of an **Embedded DC Converter Station** within its system not subject to a **Bilateral Agreement**, with

existing or proposed **DC Converter Stations** shall provide **NGC** with data relating to each of those **DC Converter Stations**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4. However, no data need be supplied in relation to those **Embedded Medium Power Stations** or **Embedded DC Converter Stations** if they are connected at a voltage level below the voltage level of the **Subtransmission System** except in connection with an application for, or under a, **CUSC Contract** or unless specifically requested by **NGC** under PC.A.5.1.4.

……..

PC.A.5.1.4 PC.A.4.2.4(b) and PC.A.4.3.2(a) explained that the forecast **Demand** submitted by each **Network Operator** must be net of the output of all **Medium Power Stations** and **Small Power Stations** and **Customer Generating Plant Embedded** within that **User's System**. In such cases (PC.A.3.1.4 also refers), the **Network Operator** must inform **NGC** of the number of such **Power Stations** (including the number of **Generating Units**) together with their summated capacity. On receipt of this data~~, the **Network Operator** or **Generator** (if the data relates to **Power Stations** referred to in PC.A.5.1.2) may be~~ further details may be required at **NGC's** discretion as follows:

(i) in the case of ~~to provide~~ details required from the **Network Operator** for~~of **Embedded Small Power Stations** and~~ **Embedded Medium Power Stations** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded Small Power Stations** and **Embedded DC Converters**, in each case, within its **System**, and **Customer Generating Plant**; and

(ii) in the case of details required from the **Generator** of **Embedded Large Power Stations** and **Embedded Medium Power Stations** subject to a **Bilateral Agreement**, and

(iii) in the case of details required from the **DC Converter Station** owner of an **Embedded DC Converter or DC Converter Station** subject to a **Bilateral Agreement**,

both current and forecast, as specified in PC.A.5.2 and PC.A.5.3. Such requirement would arise when **NGC** reasonably considers that the collective effect of a number of such **Embedded Small Power Stations** ~~and~~ , **Embedded Medium Power Stations**, **Embedded DC Converter Stations**, **DC Converter** and **Customer Generating Plants** may have a significant system effect on the **GB Transmission System**.

……..

PC.A.5.2.2 Where the **Power Station** or **DC Converter Station** has associated **Demand** additional to the unit-supplied **Demand** of

PC.A.5.2.1 which is supplied from either the **GB Transmission System** or the **Generator's User System** the **Generator** ~~or~~, **DC Converter Station** owner or the **Network Operator** (in the case of **Embedded Medium Power Stations** within its **System** not subject to a **Bilateral Agreement**), as the case may be, shall supply forecasts for each **Power Station** or **DC Converter Station** of:

a) the maximum **Demand** that, in the **User's** opinion, could reasonably be imposed on the **GB Transmission System** or the **Generator's User System** as appropriate;

b) the **Demand** at the time of the peak **GB Transmission System Demand**;

c) the **Demand** at the time of minimum **GB Transmission System Demand.**

……

PC.A.5.2.3 No later than calendar week 17 each year **NGC** shall notify each **Generator** ~~with~~ in respect of its **Large Power Stations** and~~/or~~ its **Medium Power Stations** and **DC Converter** owner in respect of its **DC Converter Stations** subject to a **Bilateral Agreement,** and each **Network Operator** in respect of each **Embedded Medium Power Station** and **Embedded DC Converter Stations** within its **System** not subject to a **Bilateral Agreement**, in writing of the following, for the current **Financial Year** and for each of the following seven **Financial Years,** which will be regarded as the relevant specified days and times under PC.A.5.2.2:

a) the date and time of the annual peak of the **GB Transmission System Demand** at **Annual ACS Conditions;**

b) the date and time of the annual minimum of the **GB Transmission System Demand** at **Average Conditions.**

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PC.A.5.3.2 The following **Synchronous Generating Unit** and **Power Station** data should be supplied:

(a) **Synchronous Generating Unit** Parameters

Rated terminal volts (kV)
* Rated MVA
* **Rated MW**
* Minimum Generation MW
* Short circuit ratio
Direct axis synchronous reactance
* Direct axis transient reactance

Direct axis sub-transient reactance
Direct axis short-circuit transient time constant.
Direct axis short-circuit sub-transient time constant.
Quadrature axis synchronous reactance
Quadrature axis sub-transient reactance
Quadrature axis short-circuit sub-transient time constant.
Stator time constant
Stator leakage reactance
Armature winding direct-current resistance.

Note: The above data item relating to armature winding direct-current resistance need only be supplied ~~by **Generators**~~ with respect to **Generating Units** commissioned after 1st March 1996 and in cases where, for whatever reason, the **Generator** or the **Network Operator**, as the case may be, is aware of the value of the relevant parameter.

* Turbogenerator inertia constant (MWsec/MVA)
Rated field current (amps) at **Rated MW** and Mvar output and at rated terminal voltage.

Field current (amps) open circuit saturation curve for **Generating Unit** terminal voltages ranging from 50% to 120% of rated value in 10% steps as derived from appropriate manufacturers test certificates.

(b) Parameters for **Generating Unit** Step-up Transformers

* Rated MVA
Voltage ratio
* Positive sequence reactance
(at max, min, & nominal tap)
Positive sequence resistance
(at max, min, & nominal tap)
Zero phase sequence reactance
Tap changer range
Tap changer step size
Tap changer type: on load or off circuit

(c) Excitation Control System parameters

Note: The data items requested under Option 1 below may continue to be provided ~~by **Generators**~~ in relation to **Generating Units** on the **System** at 09 January 1995 (in this paragraph, the "relevant date") or ~~they may provide~~ the new data items set out under Option 2 may be provided. **Generators** or **Network Operators,** as the case may be, must supply the data as set out under Option 2 (and not those under Option 1) for **Generating Unit** excitation control systems commissioned after the relevant date, those **Generating Unit** excitation control systems recommissioned for any reason such

as refurbishment after the relevant date and **Generating Unit** excitation control systems where, as a result of testing or other process, the **Generator** or the **Network Operator**, as the case may be, is aware of the data items listed under Option 2 in relation to that **Generating Unit**.

Option 1

DC gain of **Excitation Loop**
Rated field voltage
Maximum field voltage
Minimum field voltage
Maximum rate of change of field voltage (rising)
Maximum rate of change of field voltage (falling)
Details of **Excitation Loop** described in block diagram form showing transfer functions of individual elements.
Dynamic characteristics of **Over-excitation Limiter**.
Dynamic characteristics of **Under-excitation Limiter**

Option 2

Excitation System Nominal Response
Rated Field Voltage
No-Load Field Voltage
Excitation System On-Load Positive Ceiling Voltage
Excitation System No-Load Positive Ceiling Voltage
Excitation System No-Load Negative Ceiling Voltage

Details of **Excitation System** (including **PSS** if fitted) described in block diagram form showing transfer functions of individual elements.

Details of **Over-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

Details of **Under-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

……..

PC.A.5.4 **Non-Synchronous Generating Unit** and Associated Control System Data

PC.A.5.4.1 The data submitted below are not intended to constrain any **Ancillary Services Agreement**

PC.A.5.4.2 The following **Power Park Unit, Power Park Module** and **Power Station** data should be supplied in the case of a **Power Park Module** not connected to the **Total System** by a **DC Converter**:

(a) **Power Park Unit** model

A mathematical model of each type of **Power Park Unit** capable of representing its transient and dynamic behaviour under both small and large disturbance conditions. The model shall include non-linear effects and represent all equipment relevant to the dynamic performance of the **Power Park Unit** as agreed with **NGC**. The model shall be suitable for the study of balanced, root mean square, positive phase sequence time-domain behaviour, excluding the effects of electromagnetic transients, harmonic and sub-harmonic frequencies.

The model shall accurately represent the overall performance of the **Power Park Unit** over its entire operating range including that which is inherent to the **Power Park Unit** and that which is achieved by use of supplementary control systems providing either continuous or stepwise control. Model resolution should be sufficient to accurately represent **Power Park Unit** behaviour both in response to operation of transmission system protection and in the context of longer-term simulations.

The overall structure of the model shall include:
(i) any supplementary control signal modules not covered by (c), (d) and (e) below.
(ii) any blocking, deblocking and protective trip features that are part of the **Power Park Unit** (e.g. “crowbar”).
(iii) any other information required to model the **Power Park Unit** behaviour to meet the model functional requirement described above.

The model shall be submitted in the form of a transfer function block diagram and may be accompanied by dynamic and algebraic equations.
This model shall display all the transfer functions and their parameter values, any non wind-up logic, signal limits and non-linearities.

The submitted **Power Park Unit** model shall have been validated and this shall be confirmed by the **Generator.** The validation shall be based on comparing the submitted model simulation results against measured test results. Validation evidence shall also be submitted and this shall include the simulation and measured test results. The latter shall include appropriate short-circuit tests. In the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** the **Network Operator** will provide **NGC** with the validation evidence if requested by **NGC**.

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(h) Harmonic and flicker parameters

When connecting a **Power Park Module**, it is necessary for **NGC** to evaluate the production of flicker and

harmonics on **NGC** and **User's Systems**. At **NGC's** reasonable request, the **User** (a **Network Operator** in the case of an **Embedded Power Park Module** not subject to a **Bilateral Agreement**) is required to submit the following data (as defined in IEC 61400-21 (2001)) for each **Power Park Unit**:-

Flicker coefficient for continuous operation.
Flicker step factor.
Number of switching operations in a 10 minute window.
Number of switching operations in a 2 hour window.
Voltage change factor.
Current Injection at each harmonic for each **Power Park Unit** and for each **Power Park Module**

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **NGC** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

……..

PC.A.5.5 Response data for **Frequency** changes

The information detailed below is required to describe the actual frequency response capability profile as illustrated in Figure CC.A.3.1 of the **Connection Conditions,** and need only be provided for each ~~**Genset**~~**:** ~~at a **Large Power Stations.**~~

(i) Genset at **Large Power Station**s; and

(ii) Generating Unit, Power Park Module or **CCGT Module** at a **Medium Power Station** or **DC Converter Station** that has agreed to provide **Frequency** response in accordance with a **CUSC Contract**.

In the case of (ii) above for the rest of this PC.5.4 where reference is made to **Gensets**, it shall include such **Generating Units**, **CCGT Modules**, **Power Park Modules** and **DC Converters** as appropriate.

In this **PC.A.5.5**, for a **CCGT Module** with more than one **Generating Unit**, the phrase **Minimum Generation** applies to the entire **CCGT Module** operating with all **Generating Units Synchronised** to the **System**. Similarly for a **Power Park Module** with more than one **Power Park Unit**, the phrase **Minimum Generation** applies to the entire **Power Park Module** operating with all **Power Park Units Synchronised** to the **System.**

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Add at end of PC.A 5. 6

…..
In the case of **Embedded Medium Power Stations** and **DC Converter Stations** not subject to a **Bilateral Agreement**, upon request from **NGC** each **Network Operator** such provide the information required in PC.A.5.6.1, PCA.5.6.2, PC.A.5.6.3 and PC.A.5.6.4 in respect of such **Embedded Medium Power Stations** and **DC Converter Stations** within their **System**.

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CONNECTION CONDITIONS REVISIONS

CC.3.2 The above categories of **User** will become bound by the **CC** prior to them generating, distributing, supplying or consuming, as the case may be, and references to the various categories should, therefore, be taken as referring to them in that prospective role as well as to **Users** actually connected.

CC.3.3 The obligations within the **CC** that are expressed to be applicable to **Generators** in respect of **Embedded Medium Power Stations** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** (which are listed in CC3.4) shall be read and construed as obligations that the **Network Operator** within whose **System** any such **Medium Power Station** or **Embedded DC Converter Station** is **Embedded** must ensure are performed and discharged by the **Generator** or the **DC Converter Station** owner**.**

CC3.4 The **Network Operator** within whose **System** a **Medium Power Station** or **Embedded DC Converter Station** is **Embedded** must ensure that the following obligations in the **CC** are performed and discharged by the **Generator** in respect of each such **Embedded Medium Power Station** or the **DC Converter Station** owner in the case of an **Embedded DC Converter Station**:

CC.5.1
CC.5.2.2
CC.5.3
CC.6.1.3
CC.6.1.5 (b)
CC.6.3.2, CC.6.3.3, CC.6.3.4, CC.6.3.6, CC.6.3.7, CC.6.3.8, CC.6.3.9, CC.6.3.10, CC.6.3.12, CC.6.3.13, CC.6.3.15, CC.6.3.16
CC.6.4.4

In respect of CC.6.2.2.2, CC.6.2.2.3, CC.6.2.2.5, CC.6.1.5(a), CC.6.1.5(b) and CC6.3.11 equivalent provisions as co-ordinated and agreed with the **Network Operator** and **Generator** or **DC Converter Station** owner may be required. Details or any such requirements will be notified to the Network Operator in accordance with CC.3.5.

CC3.5 In the case of **Embedded Medium Power Stations**, **Embedded DC Converters** not subject to a **Bilateral Agreement** the requirements in:

~~*List of clauses where we specify requirements in BA*~~
CC 6.1.6
CC 6.3.8
CC 6.3.12
CC 6.3.15
CC 6.3.16

that would otherwise have been specified in a **Bilateral Agreement** will be notified to the relevant **Network Operator** in writing in accordance with the provisions of the **CUSC** and the **Network Operator** must ensure such requirements are performed and discharged by the **Generator** or the **DC Converter Station** owner.

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CC.5.1 The provisions relating to connecting to the **GB Transmission System** (or to a **User's System** in the case of a connection of an **Embedded Large Power Station** or **Embedded Medium Power Station** or **Embedded DC Converter Station**) are contained in:

(a) the **CUSC** and/or **CUSC Contract** (or in the relevant application form or offer for a **CUSC Contract**);

(b) or, in the case of an **Embedded Development**, the relevant **Distribution Code** and/or the **Embedded Development Agreement** for the connection (or in the relevant application form or offer for a **Embedded Development Agreement**),

and include provisions relating to both the submission of information and reports relating to compliance with the relevant **Connection Conditions** for that **User**, **Safety Rules**, commissioning programmes, **Operation Diagrams** and approval to connect (and their equivalents in the case of **Embedded Medium Power Stations** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**). References in the~~is~~ **CC** to the "**Bilateral Agreement**" and/or "**Construction Agreement**" and/or "**Embedded Development Agreement"** shall be deemed to include references to the application form or offer therefor.

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CC.5.2 Items for submission:

CC.5.2.1 p~~P~~rior to the **Completion Date** under the **Bilateral Agreement** and/or **Construction Agreement**, the following is submitted pursuant to the terms of the **Bilateral Agreement** and/or **Construction Agreement**:

(a) updated **Planning Code** data (both **Standard Planning Data** and **Detailed Planning Data**), with any estimated values assumed for planning purposes confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated

forecasts for **Forecast Data** items such as **Demand**, pursuant to the requirements of the **Planning Code**;

(b) details of the **Protection** arrangements and settings referred to in CC.6;

(c) copies of all **Safety Rules** and **Local Safety Instructions** applicable at **Users' Sites** which will be used at the **NGC/User** interface (which, for the purpose of **OC8,** must be to **NGC's** satisfaction regarding the procedures for **Isolation** and **Earthing**. For **User Sites** in Scotland **NGC** will consult the **Relevant Transmission Licensee** when determining whether the procedures for **Isolation** and **Earthing** are satisfactory);

(d) information to enable **NGC** to prepare **Site Responsibility Schedules** on the basis of the provisions set out in Appendix 1;

(e) an **Operation Diagram** for all **HV Apparatus** on the **User** side of the **Connection Point** as described in CC.7;

(f) the proposed name of the **User Site** (which shall not be the same as, or confusingly similar to, the name of any **Transmission Site** or of any other **User Site**);

(g) written confirmation that **Safety Coordinators** acting on behalf of the **User** are authorised and competent pursuant to the requirements of **OC8**;

(h) **RISSP** prefixes pursuant to the requirements of **OC8. NGC** is required to circulate prefixes utilising a proforma in accordance with **OC8**;

(i) a list of the telephone numbers for **Joint System Incidents** at which senior management representatives nominated for the purpose can be contacted and confirmation that they are fully authorised to make binding decisions on behalf of the **User**, pursuant to **OC9**;

(j) a list of managers who have been duly authorised to sign **Site Responsibility Schedules** on behalf of the **User**;

(k) information to enable **NGC** to prepare **Site Common Drawings** as described in CC.7;

(l) a list of the telephone numbers for the **Users** facsimile machines referred to in CC.6.5.9; and

(m) for **Sites** in Scotland a list of persons appointed by the **User** to undertake operational duties on the **User's System** and to issue and receive operational messages and instructions in relation to the **User's System**; and an

appointed person or persons responsible for the maintenance and testing of **User's Plant** and **Apparatus**.

CC.5.2.2 prior to the **Completion Date** the following must be submitted to **NGC** by the **Network Operator** in respect of an **Embedded Development:**

(a) updated **Planning Code** data (both **Standard Planning Data** and **Detailed Planning Data**), with any estimated values assumed for planning purposes confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated forecasts for **Forecast Data** items such as **Demand**, pursuant to the requirements of the **Planning Code**;

(b) details of the **Protection** arrangements and settings referred to in CC.6;

(c) the proposed name of the **Embedded Medium Power Station** or **Embedded DC Converter Station Site** (which shall be agreed with **NGC** unless it is the same as, or confusingly similar to, the name of other **Transmission Site** or **User Site**);

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CC.5.3 ~~As explained in the **Bilateral Agreement** and/or **Construction Agreement**, of the list:~~

(a) Of the items CC5.2.1(c), (e), (g), (h), (k) and (m) need not be supplied in respect of **Embedded Power Stations** or **Embedded DC Converter Stations,**

(b) item CC5.2.1(i) need not be supplied in respect of **Embedded Small Power Stations** and **Embedded Medium Power Stations** or **Embedded DC Converter Stations** with a **Registered Capacity** of less than 100MW, and

(c) items CC5.2.1(d) and (j) are only needed in the case where the **Embedded Power Station** or **Embedded DC Converter Station** is within a **Connection Site** with another **User**.

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CC.6.3.7 (a) Each **Generating Unit, DC Converter** or **Power Park Module** (excluding **Power Park Modules** in Scotland with a **Completion Date** before 1 July 2004 or in a **Power Station** in Scotland with a **Registered Capacity** less than 30MW) must be fitted with a fast acting proportional **Frequency** control device (or turbine speed governor) and unit load controller or equivalent control device to provide **Frequency** response under normal operational conditions in accordance with **Balancing**

Code 3 (**BC3**). The **Frequency** control device (or speed governor) must be designed and operated to the appropriate:

(i) **European Specification**; or

(ii) in the absence of a relevant **European Specification**, such other standard which is in common use within the European Community;

as at the time when the installation of which it forms part was designed or (in the case of modification or alteration to the **Frequency** control device (or turbine speed governor)) when the modification or alteration was designed.

The **European Specification** or other standard utilised in accordance with sub-paragraph CC.6.3.7 (a) (ii) will be notified to **NGC** ~~as:~~ by the **Generator** or **DC Converter Station** owner or, in the case of an **Embedded Medium Power Station** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**~~,~~ the relevant **Network Operator**, as:

(i) part of the application for a **Bilateral Agreement;** or

(ii) part of the application for a varied **Bilateral Agreement;** or

(iii) in the case of an **Embedded Development,** within 28 days of entry into the **Embedded Development Agreement** (or such later time as agreed with **NGC**); or

(iv) soon as possible prior to any modification or alteration to the **Frequency** control device (or governor); and

……

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CC.6.3.16 (a) **DC Converter** owners or **Network Operators** in the case of an **Embedded DC Converter** not subject to a **Bilateral Agreement** must ensure that any of their **DC Converters** will not cause a sub-synchronous resonance problem on the **Total System**. Each **DC Converter** is required to be provided with sub-synchronous resonance damping control facilities.

……

CC.6.4.4 Where~~n~~ **NGC** can reasonably demonstrate that an **Embedded ~~Person~~Medium Power Station** or **Embedded DC Converter Station** has a significant effect on the **GB Transmission System**, it

may require the **Network Operator** within whose **System** the **Embedded Person** is situated to ensure that the operational metering equipment described in CC6.5.6 is installed such that **NGC** can receive the data referred to in CC6.5.6. **NGC** shall notify such **Network Operator** of the details of such installation in writing within 3 months of being notified of the application to connect under **CUSC** and the **Network Operator** shall ensure that the data referred to in CC.6.5.6 is provided to **NGC.**

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CC.8.1 **System Ancillary Services**

The **CC** contain requirements for the capability for certain **Ancillary Services**, which are needed for **System** reasons ("**System Ancillary Services**"). There follows a list of these **System Ancillary Services**, together with the paragraph number of the **CC** (or other part of the **Grid Code**) in which the minimum capability is required or referred to. The list is divided into two categories: Part 1 lists the **System Ancillary Services** which:

(a) **Generators** in respect of **Large Power Stations** are obliged to provide; and

(b) **DC Converter Station** owners are obliged to have the capability to supply~~,~~; and

(c) **Generators** in respect of **Medium Power Stations** (except **Embedded Medium Power Stations**) are obliged to provide in respect of **Reactive Power** only;

and Part 2 lists the **System Ancillary Services** which **Generators** will provide only if agreement to provide them is reached with **NGC**:

Part 1

(a) **Reactive Power** supplied (in accordance with CC.6.3.2) otherwise than by means of synchronous or static compensators (except in the case of a **Power Park Module** where synchronous or static compensators within the **Power Park Module** may be used to provide **Reactive Power**)

(b) **Frequency** Control by means of **Frequency** sensitive generation - CC.6.3.7 and BC3.5.1

Part 2

(c) **Frequency** Control by means of **Fast Start** - CC.6.3.14

(d) **Black Start Capability** - CC.6.3.5

(e) **System to Generator Operational Intertripping**

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CC.A.3.4 TESTING OF FREQUENCY RESPONSE CAPABILITY

The response capabilities shown diagrammatically in Figure CC.A.3.1 are measured by taking the responses as obtained from some of the dynamic response tests specified by **NGC** and carried out by **Generators** and **DC Converter Station** owners for compliance purposes and to validate the content of **Ancillary Services Agreements** using an injection of a ~~f~~**Frequency** change to the plant control system (ie governor and load controller). The injected signal is a linear ramp from zero to 0.5 Hz frequency change over a ten second period, and is sustained at 0.5 Hz frequency change thereafter, as illustrated diagrammatically in figures CC.A.3.2 and CC.A.3.3. In the case of an **Embedded Medium Power Station** or **DC Converter Station** not subject to a **Bilateral Agreement, NGC** may require the **Network Operator** within whose **System** the **Embedded Medium Power Station** or **DC Converter** is situated, to ensure that the **Embedded Person** performs the dynamic response tests reasonably required by NGC in order to demonstrate compliance with the relevant requirements in the CCs.

The **Primary Response** capability (P) of a **Generating Unit** or a **CCGT Module** or a **Power Park Module** or a **DC Converter** is the minimum increase in **Active Power** output between 10 and 30 seconds after the start of the ramp injection as illustrated diagrammatically in Figure CC.A.3.2.

The **Secondary Response** capability (S) of a **Generating Unit** or a **CCGT Module** or a **Power Park Module** or a **DC Converter** is the minimum increase in **Active Power** output between 30 seconds and 30 minutes after the start of the ramp injection as illustrated diagrammatically in Figure CC.A.3.2.

The **High Frequency Response** capability (H) of a **Generating Unit** or a **CCGT Module** or a **Power Park Module** or a **DC Converter** is the decrease in **Active Power** output provided 10 seconds after the start of the ramp injection and sustained thereafter as illustrated diagrammatically in Figure CC.A.3.3.

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OPERATING CODE 1 REVISIONS

OC1.1.2 In the **Operational Planning Phase**, **Demand** forecasting shall be conducted by **NGC** taking account of **Demand** forecasts furnished by **Network Operators** ~~and in certain circumstances, **Generators**,~~ who shall provide **NGC** with information in the form set out in this **OC1**. The data supplied under the **PC** is also taken into account.

……

OC1.1.3 In the **Programming Phase** and **Control Phase**, **NGC** will conduct its own **Demand** forecasting taking into account information to be

furnished by **Suppliers**~~,~~ and **Network Operators** ~~and by **Generators**~~ and the other factors referred to in OC1.6.1.

……..

OC1.3 SCOPE

OC1 applies to **NGC** and to **Users** which in this **OC1** means:-

~~**(a)Generators**,~~

~~(b)~~(a) **Network Operators**, and

~~(c)~~(b) **Suppliers**.

……

OC1.4.1 (a) Each **User**, as specified in (b) below, shall provide **NGC** with the data requested in OC1.4.2 below.

(b) The data will need to be supplied by~~:~~

~~(i)~~ each **Network Operator** directly connected to the **GB Transmission System** in relation to **Demand Control**~~;~~ and in relation ~~and~~

~~(ii) each **Generator** with respect~~ to the output of **Embedded Medium Power Stations** within its **System.**

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OC1.5.1 **Programming Phase**

For the period of 2 to 8 weeks ahead the following will be supplied to **NGC** in writing by 1000 hours each Monday:

(a) ***Demand Control:***
Each **Network Operator** will supply MW profiles of the amount and duration of their proposed use of **Demand Control** which may result in a **Demand** change equal to or greater than the **Demand Control Notification Level** (averaged over any half hour on any **Grid Supply Point**) on a half hourly and **Grid Supply Point** basis;

(b) ***Medium Power Station** Operation:*
Each ~~**Generator**~~ **Network Operator** will, if reasonably required by **NGC**, supply MW schedules for the operation of **Embedded Medium Power Stations** within its **System** on a half hourly and **Grid Supply Point** basis.

OC1.5.2 For the period 2 to 12 days ahead the following will be supplied to **NGC** in writing by 1200 hours each Wednesday:

(a) ***Demand Control:***
Each **Network Operator** will supply MW profiles of the amount and duration of their proposed use of **Demand Control** which may result in a **Demand** change equal to or greater than the **Demand Control Notification Level** (averaged over any half hour on any **Grid Supply Point**) on a half hourly and **Grid Supply Point** basis;

(b) ***Medium Power Station** Operation:*
Each ~~**Generator**~~ **Network Operator** will, if reasonably required by **NGC**, supply MW schedules for the operation of **Embedded Medium Power Stations** within its **System** on a half hourly and **Grid Supply Point** basis.

……..

OC1.5.3 **Medium Power Station** Output:
Each ~~**Generator**~~ **Network Operator** will, if reasonably required by **NGC**, supply **NGC** with MW schedules for the operation of **Embedded Medium Power Stations** within its **System** on a half hourly and **Grid Supply Point** basis in writing by 1000 hours each day (or such other time specified by **NGC** from time to time) for the next day (except that it will be for the next 3 days on Fridays and 2 days on Saturdays and may be longer (as specified by **NGC** at least one week in advance) to cover holiday periods);

……
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OPERATING CODE 2 REVISIONS

OC2.2.1 (a) The objective of **OC2** is to seek to enable **NGC** to harmonise outages of **Gensets** in order that such outages are co-ordinated (taking account of **Embedded Medium Power Stations**) between **Generators** and **Network Operators**, and that such outages are co-ordinated taking into account **GB Transmission System** outages and other **System** outages, so far as possible to minimise the number and effect of constraints on the **GB Transmission System** or any other **System**.

(b) In the case of **Network Operator' User Systems** directly connected to the **GB Transmission System** this means in particular that there will also need to be harmonisation of outages of **Embedded Gensets,** and **GB Transmission System** outages, with **Network Operators** in respect of their outages on those **Systems**.

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OC2.4.1.1 Under **OC2** the interaction between **NGC** and **Users** will be as follows:

……..

(c)	**NGC** and each **Network Operator**	in respect of outages of all **Embedded Large Power Stations** and **Embedded Medium Power Stations** and in respect of outages of other **Plant** and/or **Apparatus** relating to such **Embedded Large Power Stations** and **Embedded Medium Power Stations**;
(d)	**NGC** and each **Network Operator** and each **Non-Embedded Customer**	in respect of **GB Transmission System** outages relevant to the particular **Network Operator** or **Non-Embedded Customers**;
(e)	Each **Network Operator** and each **Non-Embedded Customer** and **NGC**	in respect of **User System** and outages relevant to **NGC**.

……..
……..

OPERATING CODE 5 REVISIONS

OC5.1 INTRODUCTION

Operating Code No. 5 ("**OC5**") specifies the procedures to be followed by **NGC** in carrying out:

(a) monitoring

(i) of **BM Units** against their expected input or output;

(ii) of compliance by **Users** with the **CC** and in the case of response to **Frequency**, **BC3**; and

(iii) of the provision by **Users** of **Ancillary Services** which they are required or have agreed to provide; and

(b) the following tests (which are subject to **System** conditions prevailing on the day):

(i) tests on **Gensets**, **CCGT Modules, Power Park Modules**, ~~and~~ **DC Converters** and **Generating Units** (excluding **Power Park Units**) to test that they have the capability to comply with the **CC** and, in the case of response to **Frequency**, **BC3** and to provide the **Ancillary Services** that they are either required or have agreed to provide;

(ii) tests on **BM Units**, to ensure that the **BM Units** are available in accordance with their submitted **Export and Import Limits, QPNs, Joint BM Unit Data** and **Dynamic Parameters**.

The **OC5** tests include the **Black Start Test** procedure.

OC5 also specifies in OC5.8 the procedures which apply to the monitoring and testing of **Embedded Medium Power Stations** and **Embedded DC Converters** not subject to a **Bilateral Agreement**.

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OC5.5.3 Test and Monitoring Assessment

The pass criteria must be read in conjunction with the full text under the Grid Code reference. The **BM Unit, CCGT Module, Power Park Module** or **Generating Unit** (excuding **Power Park Units**) will pass the test if the criteria below are met:

	Parameter to be Tested	Grid Code Reference	Pass Criteria (to be read in conjunction with the full text under the Grid Code reference)
Voltage Quality	Harmonic Content	CC.6.1.5(a)	Measured harmonic emissions do not exceed the limits specified in the **Bilateral Agreement** or where no such limits are specified, the relevant planning level specified in G5/4.
	Phase Unbalance	CC.6.1.5(b)	The measured maximum **Phase (Voltage) Unbalance** on the **GB Transmission System** should remain, in England and Wales, below 1% and, in Scotland, below 2%.
	Phase Unbalance	CC.6.1.6	In England and Wales, measured infrequent short duration peaks in **Phase** (**Voltage**) **Unbalance** should not exceed the maximum value stated in the **Bilateral Agreement.**
	Voltage Fluctuations	CC.6.1.7(a)	In England and Wales, measured voltage fluctuations at the **Point of Common Coupling** shall not exceed 1% of the voltage level for step changes. Measured voltage excursions other than step changes may be allowed up to a level of 3%. In Scotland, measured voltage fluctuations at a **Point of Common Coupling** shall not exceed the limits set out in **Engineering Recommendation** P28.
	Flicker	CC.6.1.7(b)	Measured voltage fluctuations at a **Point of Common Coupling** shall not exceed, for voltages above 132kV, **Flicker Severity (Short Term)** of 0.8 Unit and **Flicker Severity (Long Term)** of 0.6 Unit, and, for voltages at 132kV and below, shall not exceed **Flicker Severity (Short Term)** of 1.0 Unit and **Flicker Severity (Long Term)** of 0.8 Unit, as set out in **Engineering Recommendation** P28 as current at the **Transfer Date**.

	Parameter to be Tested	Grid Code Reference	Pass Criteria (to be read in conjunction with the full text under the Grid Code reference)
Fault Clearance	Fault Clearance Times	CC.6.2.2.2.2(a) CC.6.2.3.1.1(a)	The fault clearance times shall be in accordance with the **Bilateral Agreement.**
	Back-Up Protection	CC.6.2.2.2.2(b) CC.6.2.3.1.1(b)	The **Back-Up Protection** system provided by **Generators** operates in the times specified in CC.6.2.2.2.2(b). The **Back-Up Protection** system provided by **Network Operators** and **Non-Embedded Customers** operates in the times specified in CC.6.2.3.1.1(b) and with **Discrimination** as specified in the **Bilateral Agreement.**
	Circuit Breaker fail **Protection**	CC.6.2.2.2.2(c) CC.6.2.3.1.1(c)	The circuit breaker fail **Protection** shall initiate tripping so as to interrupt the fault current within 200ms.
Reactive Capability	Reactive Capability	CC.6.3.2 CC.6.3.4	The **Generating Unit, DC Converter** or **Power Park Module** will pass the test if it is within ±5% of the reactive capability registered with **NGC** under **OC2** which shall meet the requirements set out in CC.6.3.2. The duration of the test will be for a period of up to 60 minutes during which period the **System** voltage at the **Grid Entry Point** for the relevant **Generating Unit, DC Converter** or **Power Park Module** will be maintained by the **Generator** at the voltage specified pursuant to BC2.8 by adjustment of **Reactive Power** on the remaining **Generating Units, DC Converter** or **Power Park Module**, if necessary. Any test performed in respect of an **Embedded Medium Power Station** or, **Embedded DC Converter** not subject to a **Bilateral Agreement** shall be as confirmed pursuant to OC5.8.3. Measurements of the **Reactive Power** output under steady state conditions should be consistent with Grid Code requirements i.e. fully available within the voltage range ±5% at 400kV, 275kV and 132kV and lower voltages.

	Parameter to be Tested	Grid Code Reference	Pass Criteria (to be read in conjunction with the full text under the Grid Code reference)
	Fast Start		The **Fast Start Capability** requirements of the **Ancillary Services Agreement** for that **Genset** are met.
	Black Start	OC.5.7.1	The relevant **Generating Unit** or **Power Park Module** is **Synchronised** to the **System** within two hours of the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** being required to start.
	Excitation System/ Voltage Control	CC.6.3.8(a) & BC2.11.2	Measurements of the continuously acting automatic excitation control system are required to demonstrate the provision of: (i) constant terminal voltage control; or (ii) zero MVAr transfer; or, (iii) voltage control with a **Slope** of the **Generating Unit**, **DC Converter** or **Power Park Module** as applicable without instability over the entire operating range of the **Generating Unit**, **DC Converter** or **Power Park Module**. The measured performance of the automatic excitation control system should also meet the requirements (including **Power System Stabiliser** performance) specified in the **Bilateral Agreement** and any requirements specified in an **Embedded Development Agreement**.

OC5.5.4 Test Failure/Re-test

If the **BM Unit**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**) concerned fails to pass the test the **User** must provide **NGC** with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the **User** after due and careful enquiry. This must be provided within five **Business Days** of the test. If a dispute arises relating to the failure, **NGC** and the relevant **User** shall seek to resolve the dispute by discussion, and, if they fail to reach agreement, the **User** may by notice require **NGC** to carry out a re-test on 48 hours' notice which shall be carried out following the procedure set out in OC5.5.2 and OC5.5.3 and subject as provided in OC5.5.1.3, as if **NGC** had issued an instruction at the time of notice from the **User**.

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OC5.5.5 Dispute following Re-test

If the **BM Unit**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**) in **NGC's** view fails to pass the re-test and a dispute arises on that re-test, either party may use the **Disputes Resolution Procedure** for a ruling in relation to the dispute, which ruling shall be binding.

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OC5.6.1 If following the procedure set out in OC5.5 it is accepted that the **BM Unit**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**) has failed the test or re-test (as applicable), the **User** shall within 14 days, or such longer period as **NGC** may reasonably agree, following such failure, submit in writing to **NGC** for approval the date and time by which the **User** shall have brought the **BM Unit**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**) concerned to a condition where it complies with the relevant requirement. **NGC** will not unreasonably withhold or delay its approval of the **User's** proposed date and time submitted. Should **NGC** not approve the **User's** proposed date or time (or any revised proposal), the **User** should amend such proposal having regard to any comments **NGC** may have made and re-submit it for approval.

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OC5.6.3 Once the **User** has indicated to **NGC** the date and time that the **BM Unit**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**) can achieve the parameters previously registered or submitted, **NGC** shall either accept this information or require the **User** to demonstrate the restoration of the capability by means of a repetition of the test referred to in OC5.5.2 by an

instruction requiring the **User** on 48 hours notice to carry out such a test. The provisions of this OC5.6 will apply to such further test.

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OC5.8 Procedures applying to **Embedded Medium Power Stations** and **DC Converters** not subject to a **Bilateral Agreement**

OC5.8.1 Compliance Statement

Each **Network Operator** shall ensure that each **Embedded Person** provides to the **Network Operator** upon **NGC's** request**:-**

(a) written confirmation that each such **Generating Unit**, **Power Park Module** or **DC Converters** complies with the requirements of the **CC**; and

(b) evidence, where requested, reasonably satisfactory to **NGC**, of such compliance. Such a request shall not normally be made by **NGC** more than twice in any calendar year in respect of any **Generator's Generating Unit** or **Power Park Module** or **DC Converter** owner's **DC Converter**.

The **Network Operator** shall provide the evidence or written conformation required under OC5.8.1 (a) and (b) forthwith upon receipt to **NGC.**

OC5.8.2 **Network Operator's** obligations to facilitate tests

If:

(a) the **Network Operator** fails to procure the confirmation referred to at OC5.8.1(a); or

(b) the evidence of compliance is not to **NGC's** reasonable satisfaction,

then, **NGC** shall be entitled to require the **Network Operator** to procure access upon terms reasonably satisfactory to **NGC** to enable **NGC** to witness the **Embedded Person** carrying out the tests referred to in OC5.8.3 in respect of the relevant **Embedded Medium Power Station** or **DC Converter Station**.

OC5.8.3 Testing of **Embedded Medium Power Stations** or **DC Converter Stations** not subject to a **Bilateral Agreement**

NGC may, in accordance with the provisions of OC5.8.2, at any time (although not normally more than twice in any calendar year in respect of any particular **Embedded Medium Power Station** or **DC Converter Station** not subject to a **Bilateral Agreement**) issue an instruction requiring the **Network Operator** within whose **System** the relevant **Medium Power Station** or **DC Converter** not subject to a **Bilateral Agreement** is **Embedded,** to require the **Embedded Person** to carry out a test.

Such test shall be carried out at a time no sooner than 48 hours from the time that the instruction was issued, on any one or more of the **Generating Units**, **Power Park Module** or **DC Converter** comprising part of the relevant **Embedded Medium Power Station** or **DC Converter Station** and should only be to demonstrate that:

(a) the relevant **Generating Unit**, **Power Park Module** or **DC Converter** meets the requirements of the paragraphs in the **CC** which are applicable to such **Generating Units**, **Power Park Module** or **DC Converter**;

(b) the **Reactive Power** capability registered with **NGC** under **OC2** meets the requirements set out in CC.6.3.2.

The instruction may only be issued where, following consultation with the relevant **Network Operator**, **NGC** has:

(a) confirmed to the relevant **Network Operator** the manner in which the test will be conducted, which shall be consistent with the principles established in OC5.5.2; and

(b) received confirmation from the relevant **Network Operator** that the relevant **Generating Unit**, **Power Park Module** or **DC Converter** would not then be unavailable by reason of forced outage or **Planned Outage** expected prior to the instruction.

The relevant **Network Operator** is responsible for ensuring the performance of any test so required by **NGC** and the **Network Operator** shall ensure that the **Embedded Person** retains the responsibility for ensuring the safety of personnel and plant during the test.

OC5.8.4 Test Failures/Re-tests and Disputes

The relevant **Network Operator** shall:

(a) ensure that provisions equivalent to OC5.5.4, OC5.5.5 and OC5.6 apply to **Embedded Medium Power Stations** or **DC Converter Stations** not the subject of a **Bilateral Agreement** within its **System** in respect of test failures, re-tests and disputes as to test failures and re-tests;

(b) ensure that the provisions equivalent to OC5.5.4, OC5.5.5 and OC5.6 referred to in OC5.8.4(a) are effective so that **NGC** may require, if it so wishes, the provision to it of any reports or other information equivalent to those or that to which **NGC** would be entitled in relation to test failures, re-tests and disputes as to test failures and re-tests under the provisions of OC5.5.4, OC5.5.5 and OC5.6; and

(c) the provisions equivalent to OC5.5.4, OC5.5.5 and OC5.6 referred to in OC5.8.4(a) are effective to permit **NGC** to conduct itself and take decisions in such a manner in relation to test failures, re-tests and disputes as to test failures and re-tests in

respect of **Embedded Medium Power Stations** or **DC Converter Stations** not the subject of a **Bilateral Agreement** as it is able to conduct itself and take decisions in relation to test failures, re-tests and disputes as to test failures and re-tests under OC5.5.4, OC5.5.5 and OC5.6.

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OPERATING CODE 12 REVISIONS

OC12.2.1 to ensure, so far as possible, that **System Tests** proposed to be carried out either by:

(a) a **User** (or certain persons in respect of **Systems Embedded** within a **Network Operator's System**) which may have an effect on the **Total System** or any part of the **Total System** (in addition to that **User's System**) including the **GB Transmission System**; or

(b) by **NGC** which may have an effect on the **Total System** or any part of the **Total System** (in addition to the **GB Transmission System**)

do not threaten the safety of either their personnel or the general public, cause minimum threat to the security of supplies and to the integrity of **Plant** and/or **Apparatus**, and cause minimum detriment to **NGC** and **Users**;

OC12.3 SCOPE

OC12.3.1 **OC12** applies to **NGC** and to **Users**, which in **OC12** means:-

(a) **Generators** other than in respect of **Embedded Medium Power Stations** and **Embedded Small Power Stations** (and the term **Generator** in **OC12** shall be construed accordingly);**;**

(b) **Network Operators**; and

(c) **Non-Embedded Customers**.

(d) **DC Converter Station** owners other than in respect of **Embedded DC Converter Stations**

The procedure for the establishment of **System Tests** on the **GB Transmission System**, with **Externally Interconnected System Operators** which do not affect any **User,** is set out in the **Interconnection Agreement** with each **Externally Interconnected System Operator**. The position of **Externally Interconnected System Operators** and **Interconnector Users** is also referred to in OC12.4.2.

OC12.3.2 Each **Network Operator** will liase with **NGC** as necessary in those instances where an **Embedded Person** intends to perform a **System Test** which may have an effect on the **Total System** or any part of the **Total System** (in addition to that **Generator's** or other **User's System**) including the **GB Transmission System. NGC** is not required to deal with such persons.

OC12.3.3 Each **Network Operator** shall be responsible for coordinating with the Embedded Person or such other person and assessing the effect of any **System Tests** upon:

(a) any **Embedded Medium Power Station**,– **Embedded Small Power Station** or **Embedded DC Converter Station** within the **Network Operator's System**; or

(b) any other **User** connected to or within the **Network Operator's System.**

NGC is not required to deal with such persons.

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OC12.4.1.1 Where a **User** (or in the case of a **Network Operator**, a person in respect of **Systems Embedded** within its **System**, as the case may be) would like to undertake a **System Test** it shall submit a notice (a "**Proposal Notice"**) to **NGC** at least twelve months in advance of the date it would like to undertake the proposed **System Test**.

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OC12.4.4.1 Within two months of first meeting the **Test Panel** will submit a report (a "**Proposal Report**"), which will contain:

(a) proposals for carrying out the **System Test** (including the manner in which the **System Test** is to be monitored);

(b) an allocation of costs (including un-anticipated costs) between the affected parties (the general principle being that the **Test Proposer** will bear the costs); and

(c) such other matters as the **Test Panel** considers appropriate.

The **Proposal Report** may include requirements for indemnities (including an indemnity from the relevant **Network Operator** to **NGC** and other **Users** in relation to its **Embedded Persons**) to be given in respect of claims and losses arising from the **System Test**. All **System Test** procedures must comply with all applicable legislation.

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<End of changes>

Appendix 8: Distribution Code drafting to support option 2

(Includes changes to update Distribution Code in line with BETTA)

See Separate Attachment

Appendix 9: Grid Code Medium Power Station Data Requirements including Distribution Code references

Note, this Appendix was used by the working group to aid their discussions. It does not necessarily accurately reflect current or any potential future arrangements under the Grid Code or Distribution Code.

This appendix covers the data to be supplied under the Grid Code, issue 2 revision 12, for embedded licence exempt medium Power Stations. This is compared against the data required

In relation to PC.A.3/5 data no data need be submitted for Medium Power Stations connected at a voltage level below the voltage level of the Subtransmission system except:-

1. In connection with an application for, or under, a CUSC Contract, or
2. Unless specifically requested under PC.A.3.1.4 (where the collective effect is significant)

In summary the Grid Code requirements are:
PC.A.2.5.6
PC.A.3.1.5
PC.A.3.2.2
PC.A.3.3.1
PC.A.3.4.1
PC.A.3.4.2
PC.A.5.2.2
PC.A.5.2.1
PC.A.5.3.2
PC.A.5.4.1
PC.A.5.5

Below is a more detailed list in the form of a table.

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
SCHEDULE 1						
GENERATING STATION DEMANDS:						
The maximum **Demand** that could occur.	MW Mvar	**DPD** **DPD**	PC.A.5.2.2 (a)	SPD OD	5a 6	DPC7.3.1 DOC1 App 1
Demand at specified time of annual peak half hour of **NGC Demand** at **Annual ACS Conditions.**	MW Mvar	**DPD** **DPD**	PC.A.5.2.2 (b)	SPD OD	5a 6	DPC7.3.1 DOC1 App 1
Demand at specified time of annual minimum half-hour of **NGC Demand.**	MW Mvar	**DPD** **DPD**	PC.A.5.2.2 (c)	SPD OD	5a 6	DPC7.3.1 DOC1 App 1
INDIVIDUAL **GENERATING UNIT** DATA						
Point of connection to the **NGC Transmission System** (or the **Total System** if embedded) of the **Generating Unit** (other than a **CCGT Unit**) or the **CCGT Module**, as the case may be in terms of geographical and electrical	Text	**SPD**	PC.A.3.4.1	**SPD**	5a	DPC7.3.1(a)

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
location and system voltage						
If the busbars at the **Connection Point** are normally run in separate sections identify the section to which the **Generating Unit** (other than a **CCGT Unit**) or **CCGT Module**, as the case may be is connected	Section Number	**SPD**	PC.A.3.1.5	SPD	5a	DCP7.3.1(c)
Type of **Unit** (steam, **Gas Turbine Combined Cycle Gas Turbine Unit,** tidal, wind, etc.)			PC.A.3.2.2(h)	SPD	5a	DPC7.3.1(b)
A list of the **CCGT Units** within a **CCGT Module**, identifying each **CCGT Unit**, and the **CCGT Module** of which it forms part, unambiguously. In the case of a **Range CCGT Module**, details of the possible configurations should also be submitted.		**SPD**	PC.A.3.2.2(g)			Could be classed as the info under 7.3.1(b) – but this is much less specific than the G Code provision
Rated MVA	MVA	**SPD**	PC.A.3.3.1(a)	**SPD**	5b	DPC7.3.1(b)
Rated MW	MW	**SPD**	PC.A.3.3.1(a)	**SPD**	5b	DPC7.3.1(b)
Rated terminal voltage	kV	**DPD**	PC.A.5.3.2 (a)	**SPD**	5b	DPC7.3.1(b)
Performance Chart at **Generating Unit** stator terminals		**SPD**	PC.A.3.2.2 (f)	**DPD**	5c(i)	Fig 1 DPC7 & 5c(i)
Output Usable (on a monthly basis)	MW	**SPD**	PC.A.3.2.2 (b)			
Inertia constant (for whole machine)	MW secs /MVA	**SPD**	PC.A.3.3.1(b)	**SPD**	5c(i)	DPC7.3(e)
Short circuit ratio (synchronous machines)		**SPD**	PC.A.3.3.1(b)	**SPD**	5c(i)	DPC7.3(e)
Normal auxiliary load supplied by the **Generating Unit** at rated MW output	MW Mvar	**DPD** **DPD**	PC.A.5.2.1	**DPD**	5a	DPC7.3.1 (b) for PS – not for sets. This might need adding to 5b
Rated field current at rated MW and Mvar output and at rated terminal voltage	A	**DPD**	PC.A.5.3.2.(a)	**DPD**	5c(i)	DPC7.3.2
Field current open circuit saturation curve	A	**DPD**	PC.A.5.3.2 (a)	**DPD**	5c(i)	DPC7.3.2
IMPEDANCES: (Unsaturated)						
Direct axis synchronous reactance	% on MVA	**DPD**	PC.A.5.3.2 (a)	**SPD**	5c(i)	DPC7.3.2
Direct axis transient reactance	% on MVA	**SPD**	PC.A.3.3.1(a)	**SPD**	5c(i)	DPC7.3.2
Direct axis sub-transient reactance	% on MVA	**DPD**	PC.A.5.3.2 (a)	**SPD**	5c(i)	DPC7.3.2
Quad axis synch reactance	% on MVA	**DPD**	PC.A.5.3.2 (a)	**DPD**	5c(i)	DPC7.3.2
Quad axis sub-transient reactance	% on MVA	**DPD**	PC.A.5.3.2 (a)	**DPD**	5c(i)	DPC7.3.2
Stator leakage reactance	% on MVA	**DPD**	PC.A.5.3.2 (a)	DPD	5c(i)	DPC7.3.2
Armature winding direct current resistance.	% on MVA	**DPD**	PC.A.5.3.2 (a)			Don't think this exists in D Code schedules
TIME CONSTANTS (Short-circuit and Unsaturated)						

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
Direct axis transient time constant	S	**DPD**	PC.A.5.3.2 (a)	**SPD**	5c(i)	DPC7.3.2
Direct axis sub-transient time constant	S	**SPD**	PC.A.5.3.2 (a)	**SPD**	5c(i)	DPC7.3.2
Quadrature axis sub-transient time constant	S	**DPD**	PC.A.5.3.2 (a)	**DPD**	5c(i)	DPC7.3.2
Stator time constant	S	**DPD**	PC.A.5.3.2 (a)			Does not exist in D Code schedules
GENERATING UNIT STEP-UP TRANSFORMER						DPC7.3.2(v)
Rated MVA	MVA	**SPD**	PC.A.3.3.1(c)	**SPD**	5c(v)	DPC7.3.2(v)
Voltage Ratio	-	**DPD**	PC.A.5.3.2 (b)	**SPD**	5c(v)	DPC7.3.2(v)
Positive sequence reactance:						
Max tap	% on MVA	**SPD**	PC.A.3.3.1(c)	**DPD**	5c(v)	DPC7.3.2(v)
Min tap	% on MVA	**SPD**	PC.A.3.3.1(c)	**DPD**	5c(v)	DPC7.3.2(v)
Nominal tap	% on MVA	**SPD**	PC.A.3.3.1(c)	**SPD**	5c(v)	DPC7.3.2(v)
Positive sequence resistance:						
Max tap	% on MVA	**DPD**	PC.A.5.3.2 (b)	**DPD**	5c(v)	DPC7.3.2(v)
Min tap	% on MVA	**DPD**	PC.A.5.3.2 (b)	**DPD**	5c(v)	DPC7.3.2(v)
Nominal tap	% on MVA	**DPD**	PC.A.5.3.2 (b)	**SPD**	5c(v)	DPC7.3.2(v)
Zero phase sequence reactance	% on MVA	**DPD**	PC.A.5.3.2 (b)	**DPD**	5c(v)	DPC7.3.2(v)
Tap change range	+% / -%	**DPD**	PC.A.5.3.2 (b)	**SPD**	5c(v)	DPC7.3.2(v)
Tap change step size	%	**DPD**	PC.A.5.3.2 (b)	**SPD**	5c(v)	DPC7.3.2(v)
Tap changer type, on-load or off-circuit	On/Off	**DPD**	PC.A.5.3.2 (b)	**SPD**	5c(v)	DPC7.3.2(v)
EXCITATION:						
Option 1 (for units pre 95)						
DC gain of **Excitation Loop**		**DPD**	PC.A.5.3.2 (c)			
Max field voltage	V	**DPD**	PC.A.5.3.2 (c)			
Min field voltage	V	**DPD**	PC.A.5.3.2 (c)			
Rated field voltage	V	**DPD**	PC.A.5.3.2 (c)			
Max rate of change of field volts:						
Rising	V/Sec	**DPD**	PC.A.5.3.2 (c)			
Falling	V/Sec	**DPD**	PC.A.5.3.2 (c)			
Details of **Excitation Loop** Described in block diagram form showing transfer functions of individual elements	Diagram	**DPD**	PC.A.5.3.2 (c)			
Dynamic characteristics of over-excitation limiter		**DPD**	PC.A.5.3.2 (c)			
Dynamic characteristics of under-excitation limiter		**DPD**	PC.A.5.3.2 (c)			
Option 2						
Exciter category, e.g. **Rotating Exciter**, or **Static Exciter** etc	Text	**SPD**	PC.A.3.4.2(a)	**DPD**	5c(i)	

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
Excitation System Nominal Response V_E	sec^{-1}	**DPD**	PC.A.5.3.2 (c)			
Rated Field Voltage U_{fN}	V	**DPD**	PC.A.5.3.2 (c)			
No-load Field Voltage U_{fO}	V	**DPD**	PC.A.5.3.2 (c)			
Excitation System On-Load Positive Ceiling Voltage U_{pL+}	V	**DPD**	PC.A.5.3.2 (c)			
Excitation System No-Load Positive Ceiling Voltage U_{pO+}	V	**DPD**	PC.A.5.3.2 (c)			
Excitation System No-Load Negative Ceiling Voltage U_{pO-}	V	**DPD**	PC.A.5.3.2 (c)			
Power System Stabiliser (PSS) fitted	Yes/No	**SPD**	PC.A.3.4.2(b)			
Details of **Excitation System** (including **PSS** if fitted)	Diagram	**DPD**	PC.A.5.3.2 (c)	**DPD**	5c(i)	
Details of **Over-excitation Limiter**	Diagram	**DPD**	PC.A.5.3.2 (c)			
Details of **Under-excitation Limiter**	Diagram	**DPD**	PC.A.5.3.2 (c)			
Governor						
Option 1						
GOVERNOR PARAMETERS (REHEAT UNITS)						
HP Governor average gain	MW/Hz	**DPD**	PC.A.5.3.2 (d)			
Speeder motor setting range	Hz	**DPD**	PC.A.5.3.2 (d)			
HP governor valve time constant	S	**DPD**	PC.A.5.3.2 (d)			
HP governor valve opening limits		**DPD**	PC.A.5.3.2 (d)			
HP governor valve rate limits		**DPD**	PC.A.5.3.2 (d)			
Re-heat time constant (stored **Active Energy** in reheater)	S	**DPD**	PC.A.5.3.2 (d)			
IP governor average gain	MW/Hz	**DPD**	PC.A.5.3.2 (d)			
IP governor setting range	Hz	**DPD**	PC.A.5.3.2 (d)			
IP governor time constant	S	**DPD**	PC.A.5.3.2 (d)			
IP governor valve opening limits		**DPD**	PC.A.5.3.2 (d)			
IP governor valve rate limits		**DPD**	PC.A.5.3.2 (d)			
Details of acceleration sensitive elements HP & IP in governor loop		**DPD**	PC.A.5.3.2 (d)			
Governor block diagram	diagram	**DPD**	PC.A.5.3.2 (d)			
GOVERNOR (Non-reheat steam and Gas Turbines)						
Governor average gain	MW/Hz	**DPD**	PC.A.5.3.2 (d)			
Speeder motor setting range		**DPD**	PC.A.5.3.2 (d)			
Time constant of steam or fuel governor valve	S	**DPD**	PC.A.5.3.2 (d)			
Governor valve opening limits		**DPD**	PC.A.5.3.2 (d)			
Governor valve rate limits		**DPD**	PC.A.5.3.2 (d)			
Time constant of turbine	S	**DPD**	PC.A.5.3.2 (d)			

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
Governor block diagram		**DPD**	PC.A.5.3.2 (d)			
Option 2						
All **Generating Units**						
Governor Block Diagram showing transfer function of individual elements including acceleration sensitive elements		**DPD**	PC.A.5.3.2 (d)	**DPD**	5c(i)	DPC7.3.2
Governor Time Constant	Sec	**DPD**	PC.A.5.3.2 (d)			
#Governor Deadband - Maximum Setting - Normal Setting - Minimum Setting	 ±Hz ±Hz ±Hz	 **DPD** **DPD** **DPD**	PC.A.5.3.2 (d)			
Speeder Motor Setting Range	%	**DPD**	PC.A.5.3.2 (d)			
Average Gain	MW/Hz	**DPD**	PC.A.5.3.2 (d)			
Steam Units						
HP Valve Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
HP Valve Opening Limits	%	**DPD**	PC.A.5.3.2 (d)			
HP Valve Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
HP Valve Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
HP Turbine Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
IP Valve Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
IP Valve Opening Limits	%	**DPD**	PC.A.5.3.2 (d)			
IP Valve Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
IP Valve Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
IP Turbine Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
LP Valve Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
LP Valve Opening Limits	%	**DPD**	PC.A.5.3.2 (d)			
LP Valve Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
LP Valve Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)			
LP Turbine Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
Reheater Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
Boiler Time Constant	sec	**DPD**	PC.A.5.3.2 (d)			
HP Power Fraction	%	**DPD**	PC.A.5.3.2 (d)			
IP Power Fraction	%	**DPD**	PC.A.5.3.2 (d)			
Gas Turbine Units						
Inlet Guide Vane Time Constant	sec	**DPD**	PC.A.5.3.2 (d)(iii)			
Inlet Guide Vane Opening Limits	%	**DPD**	PC.A.5.3.2 (d)(iii)			
Inlet Guide Vane Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)(iii)			
Inlet Guide Vane Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2			

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
			(d)(iii)			
Fuel Valve Time Constant	sec	**DPD**	PC.A.5.3.2 (d)(iii)			
Fuel Valve Opening Limits	%	**DPD**	PC.A.5.3.2 (d)(iii)			
Fuel Valve Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)(iii)			
Fuel Valve Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)(iii)			
Waste Heat Recovery Boiler Time Constant		**DPD**	PC.A.5.3.2 (d)(iii)			
Hydro **Generating Units**						
Guide Vane Actuator Time Constant	sec	**DPD**	PC.A.5.3.2 (d)(iv)			
Guide Vane Opening Limits	%	**DPD**	PC.A.5.3.2 (d)(iv)			
Guide Vane Opening Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)(iv)			
Guide Vane Closing Rate Limits	%/sec	**DPD**	PC.A.5.3.2 (d)(iv)			
Water Time Constant	sec	**DPD**	PC.A.5.3.2 (d)(iv)			
SCHEDULE 2 OUTPUT CAPABILITY						
Registered Capacity on a station and unit basis (on a station and module basis in the case of a **CCGT Module** at a **Large Power Station)**	MW	**SPD**	PC.A.3.2.2(a)	**SPD**	5a & 5b	DPC7.3.2
Minimum Generation (on a module basis in the case of a **CCGT Module** at a **Large Power Station)**	MW	**SPD**	PC.A.3.2.2(d)	**SPD**	5b	DPC7.3.2
MW available from **Generating Units** in excess of **Registered Capacity**	MW	**SPD**	PC.A.3.2.2(e)			Not explicitly covered
REGIME UNAVAILABILITY						
These data blocks are provided to allow fixed periods of unavailability to be registered.						
Expected Running Regime. Is **Power Station** normally available for full output 24 hours per day, 7 days per week? If No please provide details of unavailability below.		**SPD**	PC.A.3.2.2(h)	**SPD**	5a	DPC7.3.1
Synchronising Generation (SYG) after 48 hour **Shutdown**	MW	**DPD**				
System Constrained Capacity , to be supplied by the **Network Operator**	MW	**SPD**	PC.A.3.2.2(c)			
SCHEDULE 14				**SPD**	5a	
Name of **Power Station**						

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
Number of **Unit Transformer**						
Symmetrical three phase short-circuit current infeed through the **Unit Transformers**(s) for a fault at the **Generating Unit** terminals						
- at instant of fault	kA	**SPD**	PC.A.2.5.6(a)(i)			
- after subtransient fault current contribution has substantially decayed	kA	**SPD**	PC.A.2.5.6(a)(ii)			
Positive sequence X/R ratio at instance of fault		**SPD**	PC.A.2.5.6(a)(v)			
Subtransient time constant (if significantly different from 40ms)	ms	**SPD**	PC.A.2.5.6(b)			
Pre-fault voltage at fault point (if different from 1.0 p.u.)		**SPD**	PC.A.2.5.6(a)(iv)			
The following data items need only be supplied if the **Generating Unit** Step-up Transformer can supply zero sequence current from the **Generating Unit** side to the **NGC** System Zero sequence source impedances as seen from the **Generating Unit** terminals consistent with the maximum infeed above: - Resistance - Reactance	% on 100	**SPD**	PC.A.2.5.6(a)(iii)			
Name of **Power Station** Number of **Station Transformer**						
Symmetrical three phase short-circuit current infeed for a fault at the **Connection Point**						
- at instant of fault	kA	**SPD**	PC.A.2.5.6(a)(i)			
- after subtransient fault current contribution has substantially decayed	kA	**SPD**	PC.A.2.5.6(a)(ii)			
Positive sequence X/R ratio At instance of fault		**SPD**	PC.A.2.5.6(a)(v)			
Subtransient time constant (if significantly different from 40ms)	mS	**SPD**	PC.A.2.5.6(b)			
Pre-fault voltage (if different from 1.0 p.u.) at fault point		**SPD**	PC.A.2.5.6(a)(iv)			
Zero sequence source Impedances as seen from the **Point of Connection** Consistent with the maximum Infeed above: - Resistance - Reactance	% on 100	**SPD**	PC.A.2.5.6(a)(iii)			
SCHEDULE 3						
PLANNING FOR YEARS 3 - 7 AHEAD						
Monthly average OU	MW	SPD	PC.A.3.2.2(b)	OD	7	

Grid Code Data Description	Type	GC	GC Clause	DC	Sch	DC Clause
Expected running regime(s)		SPD	PC.A.3.2.2(h)			
MW loading Points (for MPS with BA)		SPD	PC.A.5.4.1			
Schedule 15						
Mothballed Generating Unit data		DPD	PC.A.5.5.1/2			
Alternative Fuels data for **Generating Units**		DPD	PC.A.5.5.3/4			