A REPORT TO THE AUTHORITY

Pursuant to Paragraph 2 of Condition 7 of the Transmission Licence.

Proposed Grid Code Modification

Proposed Changes to Grid Code OC5 –

Testing and Monitoring

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

Consultation Paper Ref	D/02
Issue	1
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Prepared by	National Grid

DISTRIBUTION

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

1. Paragraph 2 of Condition 7 of the Transmission Licence granted to the National Grid Company plc ("National Grid") provides that National Grid shall, in consultation with authorised electricity operators liable to be materially affected thereby, periodically review the Grid Code and its implementation. That paragraph also requires National Grid, following such review, to send to the Authority:-

   (a) a report on the outcome of such review;

   (b) any proposed revisions to the Grid Code as National Grid (having regard to the outcome of such review) reasonably thinks fit for the achievement of the objectives set out in sub-paragraph (b) of Condition 7 of the Transmission Licence; and

   (c) any written representations or objections from authorised electricity operators (including any proposals by such operators for revisions to the Grid Code not accepted by National Grid in the course of the review) arising during the consultation process and subsequently maintained.

2. National Grid has just completed a review of the Grid Code. This review relates to proposed changes to the Grid Code OC5 – Testing and Monitoring. Attached as Appendix A are the proposed revisions to the current Grid Code OC5 (shown in typed form with the deletions crossed through and additions double underlined).

3. The proposed changes to the Grid Code were discussed at the Grid Code Review Panel on 23rd May 2002 and it was agreed that National Grid should issue a Consultation Paper.

4. National Grid, in accordance with its obligations under its Transmission Licence, consulted those authorised electricity operators listed in Appendix C by circulating to them Consultation Paper D/02, which was issued on 18th June 2002 and which contained the proposed amendments to the Grid Code. A copy of Consultation Paper D/02 is attached to this Report as Appendix B. National Grid also placed a copy of the Consultation Paper on its website to ensure its wide availability.

5. Comments were invited from all such authorised electricity operators by 12th July 2002. National Grid has received responses from 6 authorised electricity operators. Respondents generally supported the proposed changes although 2 respondents raised some concerns. One respondent required confirmation that the proposed changes did not impose additional provisions on Users. Another respondent raised some concerns related to safety issues. National Grid has responded to each of the respondents and where changes to the original proposals have been identified these are indicated in Appendix A by a vertical line in the right hand margin.

6. The proposed revisions to the Grid Code are, as indicated above, set out in Appendix A to this Report. By way of summary, the proposed changes are described below :-

Background

6.1 Operating Code No 5 (OC5) of the Grid Code lays out the rules for the monitoring (and when necessary the testing) of Users equipment to ensure compliance with the selected parts of the Grid Code, Ancillary Service Agreements and Dynamic Parameters. Grid Code OC5 also lays down the framework for the handling and resolution of disputes as a result of the monitoring and testing process. It was recognised that OC5 would benefit from redrafting of the text for clarification. It was further recognised that the OC5 provisions did not contain full provisions for testing Generator Connection Conditions and testing for Connection Conditions on User Networks.

6.2 In November 2000, a Grid Code OC5 working group was set up initially to consider clarification of the text of OC5. This resulted in the implementation of Revision 4 to the Grid Code in December 2001. The Grid Code Review Panel then agreed that the OC5 Working Group should go on to consider the full inclusion of appropriate Grid Code Connection Conditions in OC5.

The Proposed Changes

6.3 It is proposed to include full references to Generator Connection Conditions for compliance and ongoing lifetime testing within in the table associated with OC.5.5.3 (Test and Monitoring Assessment). It is also proposed that provisions for testing for Connection Conditions on User networks are included in this table. Rather than repeat the full text of the relevant sections of the Connection Conditions in the Table of OC5.5.3, it is proposed that a summary only of the provisions be provided. The reader would then be referred to the relevant sections of the Grid Code Connection Conditions for the full text of the provisions. It should be noted that the proposed changes and additions to the table in Grid Code OC5.5.3 would not change the technical obligations placed on the Generators and the Network Operators by the Connection Conditions.

6.4 Further it is proposed that clarification of the reasons that might lead to the requirements for a request for testing to be raised is included in OC5.4.2 & OC5.5.1

6.5 It is also proposed to amend OC.5.5.2.2 in order to clarify the control system signals that might be requested where on site testing is witnessed.

6.6 As a result of comments received in response to Consultation Paper D/02, it is further proposed to include a new clause (OC5.5.2.4) clarifying that the User remains responsible for safety issues while carrying out tests requested by National Grid.

6.7 Appendix A contains the full OC5 for reference with the proposed amendments highlighted.

7. As indicated above, having regard to the outcome of the review described in this Report, National Grid proposes the revisions to the Grid Code set out in Appendix A, which revisions we reasonably think fit for the achievement of the objectives referred to in sub-paragraph (b) of paragraph 1 of Condition 7 of the Transmission Licence. In view of this, National Grid would be grateful if the Authority would approve the revisions pursuant to paragraph 3 of Condition 7 of the Transmission Licence.

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

SIGNED BY

For and on behalf of The National Grid Company plc
6th September 2002

Appendix A

OPERATING CODE NO. 5

TESTING AND MONITORING

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** 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.

OC5.2 OBJECTIVE

The objectives of **OC5** are to establish:

(a) that **Users** comply with the **CC**;

(b) whether **BM Units** operate in accordance with their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**

(c) whether each **BM Unit** is available as declared in accordance with its submitted **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters**; and

(d) whether **Generators** and **Suppliers** can provide those **Ancillary Services** which they are either required or have agreed to provide.

In certain limited circumstances as specified in this **OC5** the output of **CCGT Units** may be verified, namely the monitoring of the provision of **Ancillary Services** and the testing of **Reactive Power** and automatic **Frequency Sensitive Operation**;

OC5.3 SCOPE

OC5 applies to **NGC** and to **Users** which in **OC5** means:

(a) **Generators**;

(b) **Network Operators;**

(c) **Non-Embedded Customers**; and

(d) **Suppliers.**

OC5.4 MONITORING

OC5.4.1 Parameters to be monitored

NGC will monitor the performance of

(a) **BM Units** against their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**;

(b) compliance by **Users** with the **CC**; and

(c) the provision by **Users** of **Ancillary Services** which they are required or have agreed to provide.

OC5.4.2 Procedure for Monitoring

OC5.4.2.1 In the event that a **BM Unit** fails persistently, in **NGC's** reasonable view, to follow, in any material respect, its expected input or output or a **User** fails persistently to comply with the **CC** and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required, or has agreed, to provide, **NGC** shall notify the relevant **User** giving details of the failure and of the monitoring that **NGC** has carried out.

OC5.4.2.2 The relevant **User** will, as soon as possible, provide **NGC** with an explanation of the reasons for the failure and details of the action that it proposes to take to:

(a) enable the **BM Unit** to meet its expected input or output or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period, or

(b) in the case of a **Generating Unit** or **CCGT Module** to comply with the **CC** and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period.

OC5.4.2.3 **NGC** and the **User** will then discuss the action the **User** proposes to take and will endeavour to reach agreement as to

(a) any short term operational measures necessary to protect other Users and;

(b) the parameters which are to be submitted for the **BM Unit** and the effective date(s) for the application of the agreed parameters.

OC5.4.2.4 In the event that agreement cannot be reached within 10 days of notification of the failure by **NGC** to the **User**, **NGC** or the **User** shall be entitled to require a test, as set out in OC5.5 and OC5.6, to be carried out.

OC5.5 PROCEDURE FOR TESTING

OC5.5.1 Request For Testing

OC5.5.1.1 **NGC** may at any time (although ~~it may not do so~~not normally more than twice in any calendar year in respect of any particular **BM Unit** ~~except to the extent that it can on reasonable grounds justify the necessity for further tests or unless the further test is a re-test~~) issue an instruction requiring a **User** to carry out a test, provided **NGC** has reasonable grounds of justification based upon:

(a) a submission of data from a **User** indicating a change in performance;

(b) a statement from a **User** indicating a change in performance;

(c) monitoring carried out in accordance with OC5.4.2;

(d) notification from a User of completion of an agreed action from OC5.4.2.

OC5.5.1.2 The test, referred to in OC5.5.1.1 and 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 **User's BM Units** ~~to~~ should only be to demonstrate that the relevant **BM Unit**:

a) if active in the **Balancing Mechanism**, meets the ability to operate in accordance with its submitted **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** and achieve its expected input or output which has been monitored under OC5.4; and

b) meets the requirements of the paragraphs in the **CC** which are applicable to such **BM Units**; and

in the case of a **BM Unit** comprising a **Generating Unit** or a **CCGT Module** meets,

~~b~~c) the requirements for operation in **Frequency Sensitive Mode** and compliance with the requirements for operation in **Limited Frequency Sensitive Mode** in accordance with CC.6.3.3, BC3.5.2 and BC3.7.2; or

~~c~~d) the terms of the applicable **Supplemental Agreement** agreed with the **Generator** to have a **Fast Start Capability**; or

~~d~~e) the **Reactive Power** capability registered with **NGC** under **OC2** which shall meet the requirements set out in CC.6.3.2. In the case of a test on a **Generating Unit** within a **CCGT Module** the instruction need not identify the particular **CCGT Unit** within the **CCGT Module** which is to be tested, but instead may specify that a test is to be carried out on one of the **CCGT Units** within the **CCGT Module**.

OC5.5.1.~~2~~3 (a) The instruction referred to in OC5.5.1.1 may only be issued if the relevant **User** has submitted **Export and Import Limits** which notify that the relevant **BM Unit** is available in respect of the **Operational Day** current at the time at which the instruction is issued. The relevant **User** shall then be obliged to submit **Export and Import Limits** with a magnitude greater than zero for that **BM Unit** in respect of the time and the duration that the test is instructed to be carried out, unless that **BM Unit** would not then be available by reason of forced outage or **Planned Outage** expected prior to this instruction.

(b) In the case of a **CCGT Module** the **Export and Import Limits** data must relate to the same **CCGT Units** which were included in respect of the **Operational Day** current at the time at which the instruction is issued and must include, in relation to each of the **CCGT Units** within the **CCGT Module**, details of the various data set out in BC1.A.1.3 and BC1.A.1.5, which parameters **NGC** will utilise in instructing in accordance with this OC5 in issuing **Bid-Offer Acceptances**. The parameters shall reasonably reflect the true operating characteristics of each **CCGT Unit**.

OC5.5.2 Conduct Of Test

OC5.5.2.1 The performance of the **BM Unit** will be recorded at **NGC Control Centres** with monitoring at site when necessary, from voltage and current signals provided by the **User** for each **BM Unit** under CC.6.6.1.

OC5.5.2.2 If monitoring at site is undertaken, the performance of the **BM Unit** will be recorded on a ~~chart~~ suitable recorder (with measurements, in the case of a **Generating Unit**, taken on the **Generating Unit** Stator Terminals / on the **LV** side of the generator transformer) in the relevant **User's Control Room**, in the presence of a reasonable number of representatives appointed and authorised by **NGC**. If **NGC** or the **User** requests, monitoring at site will include measurement of the ~~governor pilot oil/valve position.~~following control system parameters:

a) for Steam Turbines: governor pilot oil pressure, valve position and steam pressure;
b) for Gas Turbines: Inlet Guide Vane Position, Fuel Valve Positions, Fuel Demand Signal and Exhaust Gas Temperature
c) for Hydro Turbines: Governor Demand Signal, Actuator Output Signal, Guide Vane Position
d) for Excitation Systems: Generator Field Voltage and Power System Stabiliser signal where appropriate

OC5.5.2.3 The test will be initiated by the issue of instructions, which may be accompanied by a **Bid-Offer Acceptance**, under **BC2** (in accordance with

the **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** which have been submitted for the day on which the test was called, or in the case of a **CCGT Unit**, in accordance with the parameters submitted under OC5.1.~~2~~3). The instructions in respect of a **CCGT Unit** within a **CCGT Module** will be in respect of the **CCGT Unit**, as provided in BC2.

OC5.5.2.4 The **User** is responsible for carrying out the test when requested by **NGC** in accordance with OC5.5.1 and retains responsibility for the safety of personnel and plant during the test.

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** 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	CC6.1.5 (a)	Measured harmonic emissions do not exceed the limits specified in the **Bilateral Agreement**.
	Phase Unbalance	CC6.1.5 (b)	The measured maximum negative phase sequence component of the phase voltage on the **NGC Transmission System** should remain below 1%.
	Phase Unbalance	CC.6.1.6	Measured infrequent short duration peaks in phase unbalance should not exceed the maximum value stated in the **Bilateral Agreement**.
	Voltage Fluctuations	CC.6.1.7 (a)	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%.
	Flicker	CC.6.1.7 (b)	Measured voltage fluctuations at the **Point of Common Coupling** shall not exceed **Flicker Severity (Short Term)** of 0.8 Unit and a **Flicker Severity (Long Term)** of 0.6 Unit, as set out in **Engineering Recommendation** P28 as current at the **Transfer Date**.

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 200 ms
Reactive Capability	Reactive Capability	CC.6.3.2 CC.6.3.4	**Generating Unit** 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** will be maintained by the **Generator** at the voltage specified pursuant to BC2.8 by adjustment of **Reactive Power** on the remaining **Generating Units**, if necessary. 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.

Governor System Compliance	Primary, Secondary and High Frequency Response	~~ASA~~	The measured response in MW/Hz is within ±5% of the level of response specified in the **Ancillary Services Agreement** for that **Genset.**
	Stability With Voltage	CC.6.3.4	The measured **Active Power** output under steady state conditions of any **Generating Unit** directly connected to the **NGC Transmission System** should not be affected by voltage changes in the normal operating range.
	Governor Standard~~Compliance~~	CC.6.3.7 (a)	Measurements indicate that the Governor parameters are within the criteria set out in the appropriate governor standard (the version of which to apply being determined within CC.6.3.7).
	Governor Stability	CC.6.3.7 (b)	The measured **Generating Unit Active Power Output** shall be stable over the entire operating range of the **Generating Unit**.
	Governor Droop	CC.6.3.7 (c) (ii)	The measured speed governor overall speed droop should be between 3% and 5%.
	Governor Deadband	CC.6.3.7 (c) (iii)	Except for **Steam Unit** within a **CCGT Module,** the measured speed governor deadband shall be no greater than 0.03Hz (for the avoidance of doubt, ±0.015Hz).
	Target Frequency	CC.6.3.7 (d)	**Target Frequency** settings over at least the range 50 ±0.1 Hz shall be available.
	Response Capability	CC.6.3.7 (e) CC.A.3.	The measured frequency response of each **Generating Unit** and/or **CCGT Module** which has a **Completion Date** after 1 January 2001 shall meet requirement profile contained in Connection Conditions Appendix 3.
	Limited High Frequency Response	BC3.7.2(b)	The measured response is within the requirements of BC3.7.2. i.e. the measured rate of change of **Active Power** output must be at least 2% of output per 0.1Hz deviation of **System Frequency** above 50.4Hz.
	Output at reduced System Frequency	CC.6.3.3 BC3.5.1	For variations in **System Frequency** exceeding 0.1Hz within a period of less than 10 seconds, the **Active Power** output is within ±0.2% of the requirements of CC.6.3.3 when monitored at prevailing external air temperatures of up to 25ºC.

	Fast Start	~~ASA~~	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** 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	CC.6.3.8(a) & BC.2.11.2	Measurements of the continuously acting automatic excitation control system are required to demonstrate the provision of constant terminal voltage control of the **Generating Unit** without instability over the entire operating range of the **Generating Unit**. The measured performance of the automatic excitation control system should also meet the requirements (including **Power System Stabiliser** performance) specified in the **Bilateral Agreement**.
Dynamic	**Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters**	OC5	The **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** under test are within 2½% of the declared value being tested. The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.
	Synchron -isation time	BC2.5.2.3	**Synchronisation** takes place within ±5 minutes of the time it should have achieved **Synchronisation.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.

Run-up rates	OC5	Achieves the instructed output and, where applicable, the first and/or second intermediate breakpoints, each within ±3 minutes of the time it should have reached such output and breakpoints from **Synchronisation** (or break point, as the case may be), calculated from the run-up rates in its **Dynamic Parameters.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.
Run-down rates	OC5	Achieves the instructed output within ±5 minutes of the time, calculated from the run-down rates in its **Dynamic Parameters.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.

Due account will be taken of any conditions on the **System** which may affect the results of the test. The relevant **User** must, if requested, demonstrate, to **NGC's** reasonable satisfaction, the reliability of the ~~chart~~ suitable recorders, disclosing calibration records to the extent appropriate.

OC5.5.4 Test Failure/Re-test

If the **BM Unit** 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.~~2~~,3 as if **NGC** had issued an instruction at the time of notice from the **User**.

OC5.5.5 Dispute following Re-test

If the **BM Unit** 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.

OC5.6 **DISPUTE RESOLUTION**

OC5.6.1 If following the procedure set out in OC5.5 it is accepted that the **BM Unit** 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** 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.

OC5.6.2 If a **BM Unit** fails the test, the **User** shall submit revised **Export and Import Limits, QPN, Joint BM Unit Data** and/or **Dynamic Parameters**, or in the case of a **BM Unit** comprising a **Generating Unit** or a **CCGT Module,** the **User** may amend, with **NGC**'s approval, the relevant registered parameters of that **Generating Unit** or **CCGT Module**, as the case may be, relating to the criteria, for the period of time until the **BM Unit** can achieve the parameters previously registered, as demonstrated in a re-test.

OC5.6.3 Once the **User** has indicated to **NGC** the date and time that the **BM Unit** 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.

OC5.7 **BLACK START TESTING**

OC.5.7.1 General

(a) **NGC** may require a **Generator** with a **Black Start Station** to carry out a test (a "**Black Start Test**") on a **Genset** in a **Black Start Station** either while the **Black Start Station** remains connected to an external alternating current electrical supply (a "**BS Unit Test**") or while the **Black Start Station** is disconnected from all external alternating current electrical supplies (a "**BS Station Test**"), in order to demonstrate that a **Black Start Station** has a **Black Start Capability**.

(b) Where **NGC** requires a **Generator** with a **Black Start Station** to carry out a **BS Unit Test**, **NGC** shall not require the **Black Start Test** to be carried out on more than one Genset at that Black Start Sta**tion** at the same time, and would not, in the absence of exceptional circumstances, expect any of the other **Genset** at the **Black Start Station** to be directly affected by the **BS Unit Test**.

(c) **NGC** may require a **Generator** with a **Black Start Station** to carry out a **BS Unit Test** at any time (but will not require a **BS Unit Test** to be carried out more than once in each calendar year in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test, and will not require a **BS Station Test** to be carried out more than once in every two calendar years in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).

(d) When **NGC** wishes a **Generator** with a **Black Start Station** to carry out a **Black Start Test**, it shall notify the relevant **Generator** at least 7 days prior to the time of the **Black Start Test** with details of the proposed **Black Start Test**.

OC.5.7.2 Procedure for a **Black Start Test**

The following procedure will, so far as practicable, be carried out in the following sequence for **Black Start Tests**:

OC.5.7.2.1 BS Unit Tests

(a) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**;

(b) All the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** in the **Black Start Station** in which that **Generating Unit** is situated, shall be **Shutdown**.

(c) The **Generating Unit** shall be **De-Loaded** and **De-Synchronised** and all alternating current electrical supplies to its **Auxiliaries** shall be disconnected.

(d) The **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** to the relevant **Generating Unit** shall be started, and shall re-energise the **Unit Board** of the relevant **Generating Unit**.

(e) The **Auxiliaries** of the relevant **Generating Unit** shall be fed by the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)**, via the **Unit Board**, to enable the relevant **Generating Unit** to return to **Synchronous Speed**.

(f) The relevant **Generating Unit** shall be **Synchronised** to the **System** but not **Loaded**, unless the appropriate instruction has been given by **NGC** under **BC2**.

OC.5.7.2.2 **BS Station Test**

(a) All **Generating Units** at the **Black Start Station**, other than the **Generating Unit** on which the **Black Start Test** is to be carried out, and all the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** at the **Black Start Station**, shall be **Shutdown**.

(b) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**.

(c) The relevant **Generating Unit** shall be **De-Loaded** and **De--Synchronised**.

(d) All external alternating current electrical supplies to the **Unit Board** of the relevant **Generating Unit**, and to the **Station Board** of the relevant **Black Start Station**, shall be disconnected.

(e) An **Auxiliary Gas Turbine** or **Auxiliary Diesel Engine** at the **Black Start Station** shall be started, and shall re-energise either directly, or via the **Station Board**, the **Unit Board** of the relevant **Generating Unit**.

(f) The provisions of OC.5.7.2.1 (e) and (f) shall thereafter be followed.

OC.5.7.2.3 All **Black Start Tests** shall be carried out at the time specified by **NGC** in the notice given under OC5.7.1(d) and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by **NGC**, who shall be given access to all information relevant to the **Black Start Test**.

OC.5.7.2.4 Failure of a **Black Start Test**

A **Black Start Station** shall fail a **Black Start Test** if the **Black Start Test** shows that it does not have a **Black Start Capability** (ie. if the relevant **Generating Unit** fails to be **Synchronised** to the **System** within two hours of the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** being required to start).

OC.5.7.2.5 If a **Black Start Station** fails to pass a **Black Start Test** the **Generator** 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 **Generator** 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 **Generator** shall seek to resolve the dispute by discussion, and if they fail to reach agreement, the **Generator** may require **NGC** to carry out a further **Black Start Test** on 48 hours notice which shall be carried out following the procedure set out in OC.5.7.2.1 or OC.5.7.2.2 as the case may be, as if **NGC** had issued an instruction at the time of notice from the **Generator**.

OC.5.7.2.6 If the **Black Start Station** concerned 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.

OC.5.7.2.7 If following the procedure in OC.5.7.2.5 and OC.5.7.2.6 it is accepted that the **Black Start Station** has failed the **Black Start Test** (or a re-test carried out under OC.5.7.2.5), within 14 days, or such longer period as **NGC** may reasonably agree, following such failure, the relevant **Generator** shall submit to **NGC** in writing for approval, the date and time by which that **Generator** shall have brought that **Black Start Station** to a condition where it has a **Black Start Capability** and would pass the **Black Start Test**, and **NGC** will not unreasonably withhold or delay its approval of the **Generator's** proposed date and time submitted. Should **NGC** not approve the **Generator's** proposed date and time (or any revised proposal) the **Generator** shall revise such proposal having regard to any comments **NGC** may have made and resubmit it for approval.

OC.5.7.2.8 Once the **Generator** has indicated to **NGC** that the **Generating Station** has a **Black Start Capability**, **NGC** shall either accept this information or require the **Generator** to demonstrate that the relevant **Black Start Station** has its **Black Start Capability** restored, by means of a repetition of the **Black Start Test** referred to in OC5.7.1(d) following the same procedure as for the initial **Black Start Test**. The provisions of this OC.5.7.2 will apply to such test.

<End of OC5>

APPENDIX B

Consultation Paper D/02

CONSULTATION DOCUMENT

Proposed Changes to Grid Code OC5 –

Testing and Monitoring

The purpose of this document is to consult on the above Grid Code Modification Proposal with authorised electricity operators liable to be materially affected by the proposed changes

Consultation Ref	D/02
Issue	1
Date of Issue	18th June 2002
Prepared by	National Grid

DOCUMENT LOCATION

National Grid website:

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

DISTRIBUTION

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

A. INTRODUCTION

1. The National Grid Company plc ("National Grid"), in accordance with its obligations under paragraph 2 of Condition 7 of the Transmission Licence, believes that the time has come to review, in consultation with authorised electricity operators liable to be materially affected thereby, the Grid Code and its implementation in certain respects.

2. This review is concerned with proposed changes the Grid Code OC5 – Testing and Monitoring. The proposed changes to the Grid Code were discussed at the Grid Code Review Panel meeting held on 23rd May 2002. Panel members agreed that National Grid should issue a Consultation Paper.

3. Following receipt of comments from those authorised electricity operators which it has consulted by this Paper, National Grid intends, in accordance with paragraph 2 of Condition 7 of the Transmission Licence, to send to the Authority :-

   (a) a report on the outcome of its review, including this consultation process;

   (b) the proposed revisions to the Grid Code which National Grid (having regard to the outcome of such review) reasonably thinks fit for the achievement of the objectives of the Grid Code referred to in sub-paragraph (b) of paragraph 1 of Condition 7 of the Transmission Licence; and

   (c) any written representations or objections from authorised electricity operators (including any proposals by such operators for revisions to the Grid Code not accepted by National Grid in the course of the review) arising during the consultation process and subsequently maintained.

4. The revisions to the Grid Code proposed by National Grid and sent to the Authority then require approval by that body and will, if approved, come into force on such date (or dates) of which you will be notified by National Grid, in accordance with the Authority's approval.

B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS

5. Background

5.1 Operating Code No 5 (OC5) of the Grid Code lays out the rules for the monitoring (and when necessary the testing) of Users equipment to ensure compliance with the selected parts of the Grid Code, Ancillary Service Agreements and Dynamic Parameters. Grid Code OC5 also lays down the framework for the handling and resolution of disputes as a result of the monitoring and testing process. It was recognised that OC5 would benefit from redrafting of the text for clarification. It was further recognised that the OC5 provisions did not contain full provisions for testing Generator Connection Conditions and testing for Connection Conditions on User Networks.

5.2 In November 2000, a Grid Code OC5 working group was set up initially to consider clarification of the text of OC5. This resulted in the implementation of Revision 4 to the Grid Code in December 2001. The Grid Code Review Panel then agreed that the OC5 Working Group should go on to consider the full inclusion of appropriate Grid Code Connection Conditions in OC5.

6. The Proposed Changes

6.1 It is proposed to include full references to Generator Connection Conditions for compliance and ongoing lifetime testing within in the table associated with OC.5.5.3 (Test and Monitoring Assessment). It is also proposed that provisions for testing for Connection Conditions on User networks are included in this table. Rather than repeat the full text of the relevant sections of the Connection Conditions in the Table of OC5.5.3, it is proposed that a summary only of the provisions be provided. The reader would then be referred to the relevant sections of the Grid Code Connection Conditions for the full text of the provisions. It should be noted that the proposed changes and additions to the table in Grid Code OC5.5.3 would not change the technical obligations placed on the Generators and the Network Operators by the Connection Conditions.

6.2 Further it is proposed that clarification of the reasons that might lead to the requirements for a request for testing to be raised is included in OC5.4.2 & OC5.5.1.

6.3 It is also proposed to amend OC.5.5.2.2 in order to clarify the control system signals that might be requested where on site testing is witnessed.

6.4 Appendix 1 contains the full OC5 for reference with the proposed amendments highlighted.

B. COMMENTS

7. National Grid would be grateful to receive your comments on, or any suggestions you may have in relation to, these proposed amendments to the Grid Code. Comments would be welcomed and should be sent to National Grid **12th July 2002**. The comments will be reviewed and responded to and National Grid will then prepare its report to the Authority.

8. Your formal responses may be:-

Posted to: Mr David Payne
Network Strategy, Commercial Codes
The National Grid Company plc
National Grid House
Kirby Corner Road
Coventry
CV4 8JY

Faxed to: 024 7642 3298 Emailed to: david.payne@uk.ngrid.com

Appendix 1

OPERATING CODE NO. 5

TESTING AND MONITORING

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** 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.

OC5.2 OBJECTIVE

The objectives of **OC5** are to establish:

(a) that **Users** comply with the **CC**;

(b) whether **BM Units** operate in accordance with their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**

(c) whether each **BM Unit** is available as declared in accordance with its submitted **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters**; and

(d) whether **Generators** and **Suppliers** can provide those **Ancillary Services** which they are either required or have agreed to provide.

In certain limited circumstances as specified in this **OC5** the output of **CCGT Units** may be verified, namely the monitoring of the provision of **Ancillary Services** and the testing of **Reactive Power** and automatic **Frequency Sensitive Operation**;

OC5.3 SCOPE

OC5 applies to **NGC** and to **Users** which in **OC5** means:

(a) **Generators**;

(b) **Network Operators;**

(c) **Non-Embedded Customers**; and

(d) **Suppliers.**

OC5.4 MONITORING

OC5.4.1 Parameters to be monitored

NGC will monitor the performance of

(a) **BM Units** against their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**;

(b) compliance by **Users** with the **CC**; and

(c) the provision by **Users** of **Ancillary Services** which they are required or have agreed to provide.

OC5.4.2 Procedure for Monitoring

OC5.4.2.1 In the event that a **BM Unit** fails persistently, in **NGC's** reasonable view, to follow, in any material respect, its expected input or output or a **User** fails persistently to comply with the **CC** and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required, or has agreed, to provide, **NGC** shall notify the relevant **User** giving details of the failure and of the monitoring that **NGC** has carried out.

OC5.4.2.2 The relevant **User** will, as soon as possible, provide **NGC** with an explanation of the reasons for the failure and details of the action that it proposes to take to:

(a) enable the **BM Unit** to meet its expected input or output or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period, or

(b) in the case of a **Generating Unit** or **CCGT Module** to comply with the **CC** and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period.

OC5.4.2.3 **NGC** and the **User** will then discuss the action the **User** proposes to take and will endeavour to reach agreement as to

(a) any short term operational measures necessary to protect other Users and;

(b) the parameters which are to be submitted for the **BM Unit** and the effective date(s) for the application of the agreed parameters.

OC5.4.2.4 In the event that agreement cannot be reached within 10 days of notification of the failure by **NGC** to the **User**, **NGC** or the **User** shall be entitled to require a test, as set out in OC5.5 and OC5.6, to be carried out.

OC5.5 PROCEDURE FOR TESTING

OC5.5.1 Request For Testing

OC5.5.1.1 **NGC** may at any time (although ~~it may not do so~~not normally more than twice in any calendar year in respect of any particular **BM Unit** ~~except to the extent that it can on reasonable grounds justify the necessity for further tests or unless the further test is a re-test~~) issue an instruction requiring a **User** to carry out a test, provided **NGC** has reasonable grounds of justification based upon:

(a) a submission of data from a **User** indicating a change in performance;

(b) a statement from a **User** indicating a change in performance;

(c) monitoring carried out in accordance with OC5.4.2;

(d) notification from a User of completion of an agreed action from OC5.4.2.

OC5.5.1.2 The test, referred to in OC5.5.1.1 and 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 **User's BM Units** ~~to~~ should only be to demonstrate that the relevant **BM Unit**:

a) if active in the **Balancing Mechanism**, meets the ability to operate in accordance with its submitted **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** and achieve its expected input or output which has been monitored under OC5.4; and

b) meets the requirements of the paragraphs in the **CC** which are applicable to such **BM Units**; and

in the case of a **BM Unit** comprising a **Generating Unit** or a **CCGT Module** meets,

~~b~~c) the requirements for operation in **Frequency Sensitive Mode** and compliance with the requirements for operation in **Limited Frequency Sensitive Mode** in accordance with CC.6.3.3, BC3.5.2 and BC3.7.2; or

~~c~~d) the terms of the applicable **Supplemental Agreement** agreed with the **Generator** to have a **Fast Start Capability**; or

~~d~~e) the **Reactive Power** capability registered with **NGC** under **OC2** which shall meet the requirements set out in CC.6.3.2. In the case of a test on a **Generating Unit** within a **CCGT Module** the instruction need not identify the particular **CCGT Unit** within the **CCGT Module** which is to be tested, but instead may specify that a test is to be carried out on one of the **CCGT Units** within the **CCGT Module**.

OC5.5.1.~~2~~3 (a) The instruction referred to in OC5.5.1.1 may only be issued if the relevant **User** has submitted **Export and Import Limits** which notify that the relevant **BM Unit** is available in respect of the **Operational Day** current at the time at which the instruction is issued. The relevant **User** shall then be obliged to submit **Export and Import Limits** with a magnitude greater than zero for that **BM Unit** in respect of the time and the duration that the test is instructed to be carried out, unless that **BM Unit** would not then be available by reason of forced outage or **Planned Outage** expected prior to this instruction.

(b) In the case of a **CCGT Module** the **Export and Import Limits** data must relate to the same **CCGT Units** which were included in respect of the **Operational Day** current at the time at which the instruction is issued and must include, in relation to each of the **CCGT Units** within the **CCGT Module**, details of the various data set out in BC1.A.1.3 and BC1.A.1.5, which parameters **NGC** will utilise in instructing in accordance with this OC5 in issuing **Bid-Offer Acceptances**. The parameters shall reasonably reflect the true operating characteristics of each **CCGT Unit**.

OC5.5.2 Conduct Of Test

OC5.5.2.1 The performance of the **BM Unit** will be recorded at **NGC Control Centres** with monitoring at site when necessary, from voltage and current signals provided by the **User** for each **BM Unit** under CC.6.6.1.

OC5.5.2.2 If monitoring at site is undertaken, the performance of the **BM Unit** will be recorded on a ~~chart~~ suitable recorder (with measurements, in the case of a **Generating Unit**, taken on the **Generating Unit** Stator Terminals / on the **LV** side of the generator transformer) in the relevant **User's Control Room**, in the presence of a reasonable number of representatives appointed and authorised by **NGC**. If **NGC** or the **User** requests, monitoring at site will include measurement of the ~~governor pilot oil/valve position.~~following control system parameters:

a) for Steam Turbines: governor pilot oil pressure, valve position and steam pressure;
b) for Gas Turbines: Inlet Guide Vane Position, Fuel Valve Positions, Fuel Demand Signal and Exhaust Gas Temperature
c) for Hydro Turbines: Governor Demand Signal, Actuator Output Signal, Guide Vane Position
d) for Excitation Systems: Generator Field Voltage and Power System Stabiliser signal where appropriate

OC5.5.2.3 The test will be initiated by the issue of instructions, which may be accompanied by a **Bid-Offer Acceptance**, under **BC2** (in accordance with

the **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** which have been submitted for the day on which the test was called, or in the case of a **CCGT Unit**, in accordance with the parameters submitted under OC5.5.1.~~2~~3). The instructions in respect of a **CCGT Unit** within a **CCGT Module** will be in respect of the **CCGT Unit**, as provided in BC2.

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** 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	CC6.1.5 (a)	Measured harmonic emissions do not exceed the limits specified in the **Bilateral Agreement**.
	Phase Unbalance	CC6.1.5 (b)	The measured maximum negative phase sequence component of the phase voltage on the **NGC Transmission System** should remain below 1%.
	Phase Unbalance	CC.6.1.6	Measured infrequent short duration peaks in phase unbalance should not exceed the maximum value stated in the **Bilateral Agreement**.
	Voltage Fluctuations	CC.6.1.7 (a)	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%.
	Flicker	CC.6.1.7 (b)	Measured voltage fluctuations at the **Point of Common Coupling** shall not exceed **Flicker Severity (Short Term)** of 0.8 Unit and a **Flicker Severity (Long Term)** of 0.6 Unit, as set out in **Engineering Recommendation** P28 as current at the **Transfer Date**.

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 200 ms
Reactive Capability	Reactive Capability	CC.6.3.2 CC.6.3.4	**Generating Unit** 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** will be maintained by the **Generator** at the voltage specified pursuant to BC2.8 by adjustment of **Reactive Power** on the remaining **Generating Units**, if necessary. 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.

Governor System Compliance	Primary, Secondary and High Frequency Response	~~ASA~~	The measured response in MW/Hz is within ±5% of the level of response specified in the **Ancillary Services Agreement** for that **Genset.**
	Stability With Voltage	CC.6.3.4	The measured **Active Power** output under steady state conditions of any **Generating Unit** directly connected to the **NGC Transmission System** should not be affected by voltage changes in the normal operating range.
	Governor Standard~~Compliance~~	CC.6.3.7 (a)	Measurements indicate that the Governor parameters are within the criteria set out in the appropriate governor standard (the version of which to apply being determined within CC.6.3.7).
	Governor Stability	CC.6.3.7 (b)	The measured **Generating Unit Active Power Output** shall be stable over the entire operating range of the **Generating Unit**.
	Governor Droop	CC.6.3.7 (c) (ii)	The measured speed governor overall speed droop should be between 3% and 5%.
	Governor Deadband	CC.6.3.7 (c) (iii)	Except for **Steam Unit** within a **CCGT Module,** the measured speed governor deadband shall be no greater than 0.03Hz (for the avoidance of doubt, ±0.015Hz).
	Target Frequency	CC.6.3.7 (d)	**Target Frequency** settings over at least the range 50 ±0.1 Hz shall be available.
	Response Capability	CC.6.3.7 (e) CC.A.3.	The measured frequency response of each **Generating Unit** and/or **CCGT Module** which has a **Completion Date** after 1 January 2001 shall meet requirement profile contained in Connection Conditions Appendix 3.
	Limited High Frequency Response	BC3.7.2(b)	The measured response is within the requirements of BC3.7.2. i.e. the measured rate of change of **Active Power** output must be at least 2% of output per 0.1Hz deviation of **System Frequency** above 50.4Hz.
	Output at reduced System Frequency	CC.6.3.3 BC3.5.1	For variations in **System Frequency** exceeding 0.1Hz within a period of less than 10 seconds, the **Active Power** output is within ±0.2% of the requirements of CC.6.3.3 when monitored at prevailing external air temperatures of up to 25ºC.

	Fast Start	~~ASA~~	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** 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	CC.6.3.8(a) & BC.2.11.2	Measurements of the continuously acting automatic excitation control system are required to demonstrate the provision of constant terminal voltage control of the **Generating Unit** without instability over the entire operating range of the **Generating Unit**. The measured performance of the automatic excitation control system should also meet the requirements (including **Power System Stabiliser** performance) specified in the **Bilateral Agreement**.

Dynamic Parameters	**Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters**	OC5	The **Export and Import Limits, QPN, Joint BM Unit Data** and **Dynamic Parameters** under test are within 2½% of the declared value being tested. The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.
	Synchron -isation time	BC2.5.2.3	**Synchronisation** takes place within ±5 minutes of the time it should have achieved **Synchronisation.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.
	Run-up rates	OC5	Achieves the instructed output and, where applicable, the first and/or second intermediate breakpoints, each within ±3 minutes of the time it should have reached such output and breakpoints from **Synchronisation** (or break point, as the case may be), calculated from the run-up rates in its **Dynamic Parameters.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.
	Run-down rates	OC5	Achieves the instructed output within ±5 minutes of the time, calculated from the run-down rates in its **Dynamic Parameters.** The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under BC2 which are still in dispute following the procedure in OC5.4.2.

Due account will be taken of any conditions on the **System** which may affect the results of the test. The relevant **User** must, if requested, demonstrate, to **NGC's** reasonable satisfaction, the reliability of the ~~chart~~ suitable recorders, disclosing calibration records to the extent appropriate.

OC5.5.4 Test Failure/Re-test

If the **BM Unit** 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.~~2~~,3 as if **NGC** had issued an instruction at the time of notice from the **User**.

OC5.5.5 Dispute following Re-test

If the **BM Unit** 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.

OC5.6 **DISPUTE RESOLUTION**

OC5.6.1 If following the procedure set out in OC5.5 it is accepted that the **BM Unit** 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** 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.

OC5.6.2 If a **BM Unit** fails the test, the **User** shall submit revised **Export and Import Limits, QPN, Joint BM Unit Data** and/or **Dynamic Parameters**, or in the case of a **BM Unit** comprising a **Generating Unit** or a **CCGT Module,** the **User** may amend, with **NGC**'s approval, the relevant registered parameters of that **Generating Unit** or **CCGT Module**, as the case may be, relating to the criteria, for the period of time until the **BM Unit** can achieve the parameters previously registered, as demonstrated in a re-test.

OC5.6.3 Once the **User** has indicated to **NGC** the date and time that the **BM Unit** 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.

OC5.7 **BLACK START TESTING**

OC.5.7.1 General

(a) **NGC** may require a **Generator** with a **Black Start Station** to carry out a test (a "**Black Start Test**") on a **Genset** in a **Black Start Station** either while the **Black Start Station** remains connected to an external alternating current electrical supply (a "**BS Unit Test**") or while the **Black Start Station** is disconnected from all external alternating current electrical supplies (a "**BS Station Test**"), in order to demonstrate that a **Black Start Station** has a **Black Start Capability**.

(b) Where **NGC** requires a **Generator** with a **Black Start Station** to carry out a **BS Unit Test**, **NGC** shall not require the **Black Start Test** to be carried out on more than one Genset at that Black Start Sta**tion** at the same time, and would not, in the absence of exceptional circumstances, expect any of the other **Genset** at the **Black Start Station** to be directly affected by the **BS Unit Test**.

(c) **NGC** may require a **Generator** with a **Black Start Station** to carry out a **BS Unit Test** at any time (but will not require a **BS Unit Test** to be carried out more than once in each calendar year in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test, and will not require a **BS Station Test** to be carried out more than once in every two calendar years in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).

(d) When **NGC** wishes a **Generator** with a **Black Start Station** to carry out a **Black Start Test**, it shall notify the relevant **Generator** at least 7 days prior to the time of the **Black Start Test** with details of the proposed **Black Start Test**.

OC.5.7.2 Procedure for a **Black Start Test**

The following procedure will, so far as practicable, be carried out in the following sequence for **Black Start Tests**:

OC.5.7.2.1 BS Unit Tests

(a) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**;

(b) All the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** in the **Black Start Station** in which that **Generating Unit** is situated, shall be **Shutdown**.

(c) The **Generating Unit** shall be **De-Loaded** and **De-Synchronised** and all alternating current electrical supplies to its **Auxiliaries** shall be disconnected.

(d) The **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** to the relevant **Generating Unit** shall be started, and shall re-energise the **Unit Board** of the relevant **Generating Unit**.

(e) The **Auxiliaries** of the relevant **Generating Unit** shall be fed by the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)**, via the **Unit Board**, to enable the relevant **Generating Unit** to return to **Synchronous Speed**.

(f) The relevant **Generating Unit** shall be **Synchronised** to the **System** but not **Loaded**, unless the appropriate instruction has been given by **NGC** under **BC2**.

OC.5.7.2.2 **BS Station Test**

(a) All **Generating Units** at the **Black Start Station**, other than the **Generating Unit** on which the **Black Start Test** is to be carried out, and all the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** at the **Black Start Station**, shall be **Shutdown**.

(b) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**.

(c) The relevant **Generating Unit** shall be **De-Loaded** and **De--Synchronised**.

(d) All external alternating current electrical supplies to the **Unit Board** of the relevant **Generating Unit**, and to the **Station Board** of the relevant **Black Start Station**, shall be disconnected.

(e) An **Auxiliary Gas Turbine** or **Auxiliary Diesel Engine** at the **Black Start Station** shall be started, and shall re-energise either directly, or via the **Station Board**, the **Unit Board** of the relevant **Generating Unit**.

(f) The provisions of OC.5.7.2.1 (e) and (f) shall thereafter be followed.

OC.5.7.2.3 All **Black Start Tests** shall be carried out at the time specified by **NGC** in the notice given under OC5.7.1(d) and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by **NGC**, who shall be given access to all information relevant to the **Black Start Test**.

OC.5.7.2.4 Failure of a **Black Start Test**

A **Black Start Station** shall fail a **Black Start Test** if the **Black Start Test** shows that it does not have a **Black Start Capability** (ie. if the relevant **Generating Unit** fails to be **Synchronised** to the **System** within two hours of the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** being required to start).

OC.5.7.2.5 If a **Black Start Station** fails to pass a **Black Start Test** the **Generator** 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 **Generator** 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 **Generator** shall seek to resolve the dispute by discussion, and if they fail to reach agreement, the **Generator** may require **NGC** to carry out a further **Black Start Test** on 48 hours notice which shall be carried out following the procedure set out in OC.5.7.2.1 or OC.5.7.2.2 as the case may be, as if **NGC** had issued an instruction at the time of notice from the **Generator**.

OC.5.7.2.6 If the **Black Start Station** concerned 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.

OC.5.7.2.7 If following the procedure in OC.5.7.2.5 and OC.5.7.2.6 it is accepted that the **Black Start Station** has failed the **Black Start Test** (or a re-test carried out under OC.5.7.2.5), within 14 days, or such longer period as **NGC** may reasonably agree, following such failure, the relevant **Generator** shall submit to **NGC** in writing for approval, the date and time by which that **Generator** shall have brought that **Black Start Station** to a condition where it has a **Black Start Capability** and would pass the **Black Start Test**, and **NGC** will not unreasonably withhold or delay its approval of the **Generator's** proposed date and time submitted. Should **NGC** not approve the **Generator's** proposed date and time (or any revised proposal) the **Generator** shall revise such proposal having regard to any comments **NGC** may have made and resubmit it for approval.

OC.5.7.2.8 Once the **Generator** has indicated to **NGC** that the **Generating Station** has a **Black Start Capability**, **NGC** shall either accept this information or require the **Generator** to demonstrate that the relevant **Black Start Station** has its **Black Start Capability** restored, by means of a repetition of the **Black Start Test** referred to in OC5.7.1(d) following the same procedure as for the initial **Black Start Test**. The provisions of this OC.5.7.2 will apply to such test.

<End of OC5>

APPENDIX C - AEO Distribution List for Consultation Paper D/02

24 Seven
Accord Energy Limited
AES (for Partington Ltd)
AES Drax Power Ltd
AES Indian Queens Power
Alcan Aluminium UK Ltd
Allied Steel & Wire
Angelsey Aluminium
Atlantic Electric & Gas Ltd
Atmel North Tyneside Limited
Barking Power
BNFL + Magnox Electric Ltd
BP Chemicals Ltd
British Gas Generation Ltd (Centrica KL + Centrica PB)
British Gas Trading Ltd (3th Floor North)
Burlington Resources (Irish Sea) Ltd
Celtpower Ltd
Commercial Electricity Supplies Ltd
Corby Power Ltd
Coryton Energy Co Ltd
Cottam Power Ltd
Derwent Co-Generation Limited
East Midlands Electricity
ECOTRICITY
Electrabel S.A.
Electricity Direct (UK) Ltd
Energy Power Resources Limited
Enron Direct Ltd + Enron Gas & Petrochemical Trading
Entergy-Koch Trading Ltd
Fibrogen Ltd + Fibropower Ltd + Fibrothetford Ltd
First Hydro Company
Fortum Direct Ltd
Great Yarmouth Power Limited
Grovehurst Energy Ltd
Humber Power Ltd
Immingham CHP Ltd
Innogy + Innogy (Cogen Trading) Ltd + npower
Keadby Development Ltd
Killingholme Power Ltd
London Electricity plc
London Power Networks
Manweb Services (Imperial Park)
Medway Power Ltd

Morgan Stanley Capital Group Inc
Northern Electric Supply Ltd
Pentex Oil and Gas Ltd
Railtrack plc
Regional Power Generators Limited
Rocksavage Power Company Ltd
Saltend Cogeneration Co Ltd
Scottish & Southern (North Tynemouuth)
Scottish and Southern Energy plc
Scottish Power plc
Seabank Power Ltd
SEEBOARD Power Networks
Sheffield Heat and Power Ltd
Slough Energy Supplies Ltd
South Coast Power Ltd
SP MANWEB plc
SSE Energy Ltd
Sutton Bridge Power Ltd
Thameside Energy Park Ltd
TXU Europe

UK Electric Power Ltd
Unit Energy Limited
Utility Link Ltd
Western Gas Ltd
Williams Energy Marketing & Trading Europe Ltd
Yorkshire Electricity plc (supply)

ABB Equity Development Co Ltd
AEP Energy Services UK Generation Ltd
AES Barry Limited
AES Fifoots Point Ltd
AES NEW ENERGY LTD (UK)
Allied Domecq (Holdings) PLC
AMERADA
Aquila Energy Supplies Ltd
Atmel
Baglan Generating Ltd + Baglan Operations Ltd
BIZZENERGY LIMITED
BOC Limited
British Energy Generation Ltd
British Gas Plc
BritNed Development Ltd
Canatxx Energy Ventures Ltd
Cinergy Global Power (UK) Ltd
Conoco Global Power Developments UK Limited
Corus UK Ltd
Cottam Development Centre
Damhead Creek Ltd
Dynergy UK Ltd
Economy Power Ltd
Edison First Power Ltd
Electricite de France
Emerald Power Generation Ltd
Enfield Energy Centre Ltd
Enron Teesside Operations Ltd
Fellside Heat & Power Ltd
First Hydro Company
Fleetwood Power Ltd
GPU Power Networks (UK) Ltd
Greenwich Energy Trading Ltd
Heartlands Power Ltd
ICI Chemicals & Polymers Ltd
INEOS Chlor Energy Ltd
Jade Power Generation Ltd
Keadby Gen Ltd + HE Cogen Ltd + HE Energy Ltd
Lakeland Power Ltd
London Electricity Services Ltd
London Underground Ltd
Maverick Energy Ltd
Midlands Gas Ltd + OwnLabel Energy Ltd + Severn Trent Energy Ltd
Northern Electric Distribution Ltd
Norweb Energi Ltd
PowerGen UK plc + PowerGen CHP Ltd
Rassau Power Ltd
Renewable Energy Co
Rugeley Power Ltd
Savage Land Ltd
Scottish & Southern Energy
Scottish Power Generation Ltd
Scottsh Power Energy Retail Ltd
SEEBOARD Energy Ltd
Sempra Energy Europe Ltd
Shell Gas Direct Limited
SMARTESTENERGY LTD
Southern Electric Power Distribution plc
Spalding Energy Company Ltd
Statnett SF
Teesside Power Ltd
TotalFinaElf Gas and Power Ltd
TXU Europe Merchant Generation + Shotton CHP Ltd + Citigen (London) Ltd
UKAEA
United Utilities
Wainstones Power Ltd
Western Power Distribution
Yorkshire Electricity Group plc (distribution)
Zest4 Ltd