



**GRID CODE
CONSULTATION DOCUMENT**

Black Start

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

Consultation Ref	G/07
Issue	1.0
Date of Issue	21 st December 2007
Responses required by	31st January 2008
Prepared by	National Grid

DOCUMENT LOCATION

National Grid website:

<http://www.nationalgrid.com/uk/Electricity/Codes/gridcode/consultationpapers/>

DISTRIBUTION

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

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SUMMARY OF PROPOSALS

- 0.1 The changes proposed in this report were developed through the Black Start Working Group and endorsed by the Grid Code Review Panel (GCRP) on 15th November 2007. Should these proposals ultimately be approved by the Authority, National Grid believes that the following benefits will be realised:
- clarity of the Black Start recovery process
 - understanding of the Local Joint Restoration Plan (LJRP) process
 - shared understanding of the demand restoration process
 - understanding of Generator capabilities resulting in a more effective restoration strategy
- 0.2 The recommended changes will require changes to various sections of the Grid Code which may be summarised as follows:
- 0.2.1 Proposed changes to OC9 (Contingency Planning) Code
- Introduction of a new obligation for all signatories of an LJRP to conduct regular desktop exercises.
 - Clarification that the existing OC9.5 coding regarding Re-synchronisation of De-synchronised Islands is applicable to the Black Start recovery phase following LJRPs completion/termination.
 - Introduction of new provisions relating to the 'Returning the Total System back to normal operation'. It is believed this better reflects the issues and processes that would be considered before the Total System could return back to normal operation.
 - Within OC9.5 additional coding providing better clarity on the general strategy that will be required to recover effectively from a Partial or Total Shutdown.
- 0.2.2 Proposed changes to BC2 (Post Gate Closure Process) Code
- Clarification of the instructions given to Generators and Network Operators during a Black Start.
- 0.2.3 Proposed changes to Glossary and Definitions
- Amendment to the existing Re-synchronised definition such that it provides additional user clarification regarding the meaning of the term.
 - Amendment to the existing Local Joint Restoration Plan definition such that It cross reference to the correct OC9 provision.
- 0.2.4 Proposed changes to Planning Code and Data Registration Code
- New obligations on National Grid, Network Operators and Generators to share information that will facilitate the development of restoration strategies.

A INTRODUCTION

1. Paragraph 2 of Condition C14 of the Transmission Licence granted to the National Grid Electricity Transmission plc ("National Grid") provides that National Grid shall, in consultation with authorised electricity operators liable to be materially affected thereby, periodically review the Grid Code and its implementation. That paragraph also requires National Grid, following such review, to send to the Authority:-
 - (a) a report on the outcome of such review;
 - (b) any proposed revisions to the Grid Code as National Grid (having regard to the outcome of such review) reasonably thinks fit for the achievement of the objectives set out in sub-paragraph (b) of Condition C14 of the Transmission Licence; and
 - (c) any written representations or objections from authorised electricity operators (including any proposals by such operators for revisions to the Grid Code not accepted by National Grid in the course of the review) arising during the consultation process and subsequently maintained.
2. This review is concerned with changes to the Grid Code developed through the Black Start Working Group. The changes proposed will:
 - Introduce regular desktop exercises for LJRP parties.
 - Clarify existing provisions regarding Re-synchronisation of De-synchronised Islands as applicable to the Black Start recovery phase following LJRPs completion/termination.
 - Provide additional clarification of the instructions given to Generators and Network Operators during a Black Start.
 - Improve the transparency of the issues and process that would be considered before the Total System could return back to normal operation
 - Provide further clarification on the general strategy that will be required to recover effectively from a Partial or Total Shutdown.
 - Introduce new obligations on National Grid, Network Operators and Generators to share information that will facilitate the development of restoration strategies.
3. The proposed changes to the Grid Code were discussed with the Grid Code Review Panel on 15th November 2007. Panel members agreed that, having taken account of comments received, National Grid should issue a Consultation Paper.
4. The revisions to the Grid Code proposed by National Grid and sent to the Authority require approval by that body and will, if approved, come into force on such date (or dates) of which you will be notified by National Grid, in accordance with the Authority's approval.
5. Comments should be sent to National Grid by **31st January 2008** as detailed below in Section C. The comments will be reviewed and responded to.
6. Unless otherwise marked as confidential any responses including those containing objections to the proposals which are maintained will be published on our website.

B. DESCRIPTION OF THE PROPOSED AMENDMENTS AND THEIR EFFECTS

7. Background

- 7.1 The Grid Code Operating Code, Distribution Code and System Operator – Transmission Code (STC) establish the objectives and obligations on Users for Black Start. OC5 (Testing and Monitoring) covers the testing of Black Start Generators and OC9 covers the recovery procedure following a total shutdown or partial shutdown. Additionally STC Procedure 06-1 (Black Start) describes the planning and procedures required by National Grid and the Relevant Transmission Licensee to manage the Black Start recovery. Distribution Code OC9 covers the Black Start requirements for Distribution Users.
- 7.2 During 2005, the Energy Emergencies Executive Committee (E3C) commissioned a review and exercise of GB Black Start capabilities. This culminated in two E3C reports – The Review and Exercise Phoenix.
- 7.3 The Review report identified that more comprehensive obligations could be placed on ‘Users’ in respect to the Black Start. This is detailed in Annex B in recommendation 1.1.

8. Working Group Discussions

- 8.1 The rationale behind the proposals was developed through discussions in the Black Start Working Group. The Working Group Terms of Reference and the complete record of how the change proposals were developed can be found in the Working Group Report:

<https://www.nationalgrid.com/uk/Electricity/Codes/gridcode/workinggroups/bswg/bswg.htm>

- 8.2 The Working Group was tasked with taking forward the recommendation 1.1 of the report by the Grid Code Review Panel. The Working Group noted that any proposed changes to the existing Grid Code for Black Start may require changes across different industry codes. Therefore whilst reviewing Grid Code OC5 and OC9 the Working Group took due regard of the:

- STC – STCP06-1 (Black Start)
- Distribution Code – Operating Code
- BSC – Section G Paragraph 3

- 8.3 The Working Group debate focused on the suitability of the existing Grid Code for specifying the requirements, obligations, processes and procedures for Black Start participants across the industry. The Working Group identified that Black Start restoration has four key phases:

- Local Joint Restoration Plans
- Power Island (zonal restoration phase) expansion
- System Operational
- Market Reconvened

- 8.4 The group discussed each area in more detail, highlighting areas of concern and possible amendments to the Grid Code and associated documents.

8.5 *Local Joint Restoration Plans*

- 8.5.1 It was noted that the existing LJRP documentation provides clear instructions on the specific responsibilities and action placed upon each party to initiate the first phase of the Black Start restoration. Although there was generally agreement that the LJRPs were 'fit for purpose' it was recognised that it would be beneficial (and possible) to have greater shared understanding of the principal issues contained within each LJRP. It was noted that in preparation for Exercise Phoenix the capability of all Black Start participant companies improved. The Working Group believed that these capabilities could be maintained and improved by having regular reviews and exercising of LJRPs, including any relevant internal company procedures.
- 8.5.2 It was agreed that signatories of each LJRP should have an obligation to carry out regular joint exercising of the plans and that such exercises should be separate to the Black Start Generator tests conducted by National Grid on each station, as these are specific to physical plant performance and pursuant to bi-lateral agreements.
- 8.5.3 The general format of the exercise is likely to take the form of a desktop exercise, stepping through the LJRP. The objectives of the LJRP exercises would be:
- To maintain appropriate levels of training and awareness among control room staff
 - To promote understanding of respective dependencies between the Network Operators and the Black Start Generator
 - To demonstrate the effectiveness of the LJRP by including any identified improvements in each party's own internal Black Start plans or to the LJRP as appropriate
- 8.5.4 It was agreed to that each LJRP be tested not less than once every eight years. This frequency was considered reasonable considering that these tests would compliment the existing Black Start station tests and assurance visits that are carried out and noting that the same Network Operators are party to more than one LJRP.
- 8.5.5 National Grid will coordinate the timing of exercises and produce a schedule of proposed LRJPs to be exercised. The preparation and facilitation of the exercises would be the responsibility of all parties participating in the exercise, recognising that the success of the LJRP is reliant upon this mutual understanding. It was agreed that external observers could attend the exercises in order to increase industry participation and awareness.

8.6 *Power Island (zonal restoration phase) Expansion*

- 8.6.1 It was noted that the first phase of a Black Start restoration was well documented in the LJRPs. However there was a lack of clarity regarding the expansion of the power islands and little 'engagement' of all parties involved in the Black Start restoration, in particular non-Black Start Generators. These power islands would involve more than one Power Station and/or Network Operator and it was agreed that the Grid Code could be improved to give greater clarity on the obligations of all parties involved in the Black Start restoration. It was agreed that it would be beneficial to codify the following key areas:
- The main objectives of the Power Island expansion
 - The main roles and obligations of all Users

- Treatment of Interconnectors and embedded generation
 - Specific issues regarding connection of certain types of loads
 - Typical operational standards that may prevail
- 8.6.2 It was acknowledged that National Grid would have overall responsibility for the expansion of power islands, although this responsibility was 'delegated' in Scotland (as described in STCP06-1). National Grid explained that they have produced internal plans that identify some possible Power Island expansion scenarios. It was noted that the existing OC9.5 Re-synchronisation of De-synchronised Islands applied to the expansion of power islands following a Black Start condition. However, it was thought that the existing Grid Code wording did not make this particularly clear and therefore changes would be proposed to provide additional clarification to Users in this area.
- 8.6.3 The following priorities during the Power Island expansion phase were noted:
- Getting supplies to large non Black Start Power Stations
 - Connecting Power Islands
 - Strategic restoration of demand
- 8.6.4 The Working Group discussed how the Power Island would be controlled in relation to demand forecasting. It was National Grid's view that they would be looking to the Network Operators to forecast demand profiles. The Network Operators highlighted how difficult this would be particularly since it was not normal practice to forecast demand at Bulk Supply points and demand prediction following a total shutdown is unlikely to be representative of normal demand profiles. It was agreed that it would be necessary for National Grid and the Network Operators to collaborate over the processes for restoring demand as the power islands develop. Such collaboration would identify likely block load sizing, location and timings and associated low frequency relay settings of the block loads connected.
- 8.6.5 It was noted that all Power Stations will be expected to be ready to synchronise as soon as possible after a Partial or Total Shutdown. It was recognised that in a Total Shutdown Power Stations would not necessarily be synchronised as soon as they themselves were ready. However, knowledge of this likely availability (assessed before the Black Start) is a key factor for National Grid to plan GB restoration strategies. It was equally important to understand the block loading capability of all Power Stations. It was agreed this data was best captured via the Planning Code and Data Registration Code.
- 8.6.6 National Grid explained the importance of significant Generators not connecting to the GB Transmission System in a Black Start scenario, unless instructed to do so by National Grid (or Network Operators or Relevant Transmission Licensee when carrying out LJRP). This would also apply to 'significant' Generators connecting to Network Operators' networks. It was also important that any generation that had high variable output was not connected to the system until National Grid was confident it could be accommodated (i.e. the power islands would need to be sufficiently large to cope with the variable output). It was also noted that should any embedded generation remain connected to a small island it was highly likely that this would need to be subsequently shutdown, particularly if the system shutdown was widespread. The importance of keeping significant Generators de-synchronised until instructed otherwise was noted. It was also noted that there are currently no specific arrangements to ensure this doesn't happen. Although this should not be an issue for Generators who are signatories to

the Grid Code there is the risk that non Grid Code Generators could have a detrimental effect on small Power Islands.

8.7 *System Operational and Market Reconvened*

- 8.7.1 It was noted that National Grid is obligated to inform all Users, as soon as reasonably practical that a Black Start has been declared. The current Grid Code definition of Users does not include the BSC Panel. It was noted that BSC Panel should also be notified because of their subsequent responsibilities under Section G of the Balancing and Settlement Code (BSC).
- 8.7.2 It was noted that in the event of a Black Start being declared by National Grid (either Total or Partial shutdown of the GB Transmission System) the provisions of paragraph 3 of Section G of the BSC would apply leading to the suspension of the operation of the BM in accordance with Section Q5.4 of the BSC. As such, all trading parties should not be exposed to any imbalanced pricing during the BSC defined 'Black Start period'. All Generators would be paid a single cash out price for any energy generated during the Black Start period if instructed by National Grid. The Working Group believed that the Grid Code adequately covered the situation where instructions were given by National Grid. However the Working Group thought that the Grid Code was not clear about instructions given, in accordance with the LJRPs, by Network Operators or the Relevant Transmission Licensee to Generators. The Working Group therefore suggested that BC2.9.2.2(ii) was amended to attempt to clarify that the BSC provisions regarding compensation should be extended to Network Operators' and Relevant Transmission Licensees' instructions.
- 8.7.3 National Grid believes that this change should be effected by a BSC Modification and not by attempting to deem instruction given by Network Operators and/or Relevant Transmission Licensees in accordance with a LJRP to be Emergency Instructions given by National Grid. Amending the Grid Code in the way suggested by the Working Group may create an unintended liability for National Grid under the Grid Code in respect of actions taken by Network Operators and/or Relevant Transmission Licensees as agreed in a LJRP. The appropriate governance route to achieve the Working Group's objective of ensuring appropriate compensation during a Black Start is therefore through a BSC Modification (as paragraph 11.3 refers).
- 8.7.4 It was noted that the existing Grid Code provisions of issuing Bid Offer Acceptance instruction to non Black Start Power Station was at odds with the Emergency Instructions issued to Black Start stations. The Working Group agreed that during Black Start recovery instructions to both Black Start and non-Black Start stations should be in the format required for Emergency Instructions.
- 8.7.5 It was also noted that the BC2 format of Emergency Instructions required all instructions to be prefixed with the words "this is an Emergency Instruction". This was not thought to be practicable or helpful in a notified Black Start situation and hence it is recommended to change the existing BC2.9.2.2 wording, to clarify, for the avoidance of doubt, that all instructions in a Black Start situation would be deemed Emergency Instructions.
- 8.7.6 It was noted that the electricity trading market would be suspended during a Black Start event as specified in Section G of the BSC. It was also noted that the BSC Panel had overall responsibility to control the recommencement of the market after a Black Start event. It was recognised that National Grid,

Network Operators and Generators would be engaged in the decision of when to return to normal trading market operation.

- 8.7.7 It was noted that the current wording of OC9.4.7.9 (Conclusion of Black Start) did not clearly reflect the actual process of determining when the Total system was (or could return) 'back to normal'. The current wording could be interpreted as if 'conclusion of Black Start' and 'return to normal' operations were two distinct events and that National Grid 'formally' declares both events. Whilst it is recognised that there may well be a 'feeling' that the Black Start was over (i.e. the majority of the Total system synchronised and operating within normal standards) it was not thought that there was a distinct difference. Therefore alternative wording has been suggested to reflect that National Grid would inform the BSC panel when it considered that the Balancing Mechanism could be re-started. However the BSC panel would ultimately make the determination (in consultation with others) for the timing of the restart.
- 8.7.8 It was noted that Section G of the BSC defines the 'Black Start period' as the period between the last Settlement period when the Black Start commenced and the end of Settlement period when normal market operation resumes as determined by the BSC panel.
- 8.7.9 The issues that National Grid, in determining it was acceptable for the Balancing Mechanism to be restarted, would consider are:
- The amount of GB Transmission System energised
 - The integrity and stability of the GB Transmission System
 - The impact that a restarted BM may have on transmission constraints and hence ability to supply demand
 - The volume of generation and demand still not connected
 - Communication systems functioning normally
- 8.7.10 It was noted that in the later stages of a Black Start restoration where the total GB Transmission System was considered 'fully' operational that there may be a need to invoke aspects of demand control either as defined in OC6 or in accordance with Electricity Supply Emergency Code (ESEC) principles due to ongoing generation shortages.
- 8.8 *Other Changes*
- 8.8.1 National Grid noted that there was a need to control the subsequent re-synchronisation of 'significant' Generators as described in paragraph 8.6.6 above. This is recognised as an issue for the normal operation of the GB Transmission System and it is expected that this will be addressed by a separate Grid Code Working Group.
9. Implementation Issues
- 9.1 National Grid will give an initial indication for the forthcoming calendar year of LJRP's desktop exercises to be arranged.
- 9.2 It is anticipated that the new planning data provision requirements could be provided in the Week 24 returns for 2008 however this would be depend on the timing of the final submission of the proposals to the Authority for determination.

10. Impact on the Grid Code

10.1 The proposed changes require amendments to the following Grid Code sections:

- OC9 (Contingency Planning) Code
- BC2 (Post Gate Closure Process) Code
- Glossary and Definitions
- Planning Code
- Data Registration Code

10.2 Detailed legal text to give effect to the proposed changes may be found in Appendix A.

11. Impact on Industry Documents

Impact on Core Industry Documents

11.1 It has been noted that market participants are keenly interested in the impact of a Black Start upon operation of the balancing mechanism and a potential limitation under Paragraph 3.3 of Section G of the BSC has been identified in terms of compensation applicable to instructions given by Network Operators and Relevant Transmission Licensees under LJRPs.

11.2 In the event of a Total or Partial Shutdown of the GB Transmission System and the consequently recovery thereof, Users can expect to receive 'black start instructions' from other delegated parties i.e. Network Operators (England and Wales) and Relevant Transmission Licensees (Scotland). This situation will only be applicable during the LJRP phase of the Black Start process.

11.3 The BSC currently stipulates that Users will receive a level of monetary compensation relating to 'black start instructions' received from National Grid during the 'black start period'. It is recommended that Section G, paragraph 3.3 of the BSC is amended such that 'black start instructions' received from a Network Operators and Relevant Transmission Licensees in accordance with a LJRP, are captured by the BSC compensation mechanism. The provision will only be applicable to instructions received from the designated third parties during the LJRP phase of the Black Start process.

11.4 National Grid therefore supports the Working Group's view that further clarification of how the provisions of Section G of the BSC would be implemented in the event of a Total or Partial Shutdown would be beneficial. To this effect, a formal 'BSC Issue'¹ has been raised which will be reviewed by the BSC Settlement Standing Modification Group (SSMG). The SSMG will focus on the following issues:

- The arrangement for the formal declaration of the start of a Black Start under the BSC and calculation of the Imbalanced Price.
- Appropriate arrangements, processes and timetables to successfully reinstate the market following a Black Start
- Elexon's business continuity requirements specifically related to its role during a Black Start

¹ Issue 32 – raised 27th November 2007

<http://www.elexon.co.uk/changeimplementation/ModificationProcess/groups/issues/issues.aspx?issueID=34>

Impact on other Industry Documents

11.5 None

12. Proposed Changes

12.1 National Grid believe that the proposals outlined in this report will improve the:

- clarity of the Black Start recovery process
- understanding of the LJRP process
- shared understanding of the demand restoration process
- understanding of Generator capabilities resulting in a more effective restoration strategy

12.2 In summary the recommended changed are:

12.2.1 Introduction of a new obligation for all signatories of an LJRP to conduct regular desktop exercises.

12.2.2 Clarification that the existing OC9.5 coding regarding Re-synchronisation of De-synchronised Islands is applicable to the Black Start recovery phase following LJRPs completion/termination.

12.2.3 Clarification of the instruction given to Generators and Network Operators during a Black Start.

12.2.4 Introduction of new provisions relating to the 'Returning the Total System back to normal operation'. It is believed this better reflects the issues and process that would be considered before the Total System could return back to normal operation.

12.2.5 Within OC9.5 additional coding providing better clarity on the general strategy that will be required to recover effectively from a Partial or Total Shutdown.

12.2.6 New obligations on National Grid, Network Operators and Generators to share information that will facilitate the development of restoration strategies.

C. RESPONSES

13. This section will contain a summary of responses received during the Consultation and will be completed as part of the Report to the Authority.
14. Views are invited upon the proposals outlined in this report. Especially views on the following areas would be welcomed:
- Respondents are asked to consider whether they believe that the proposals provide beneficial clarification regarding the stages of Black Start process and of National Grid and Users' obligations.
 - Respondents are asked to consider the implications of providing the new planning data provisions.
 - Any improvements or changes to the proposals that in a respondents' view would better facilitate the objectives of the Grid Code.
15. Your formal responses may be:-

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

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

APPENDIX A: PROPOSED REVISIONS TO THE GRID CODE

Proposed Changes to OC9 (Contingency Planning)

OC9.1 **INTRODUCTION**

Operating Code No.9 ("OC9") covers the following:

OC9.1.1 **Black Starts**

The implementation of recovery procedures following a **Total Shutdown** or **Partial Shutdown**.

OC9.1.2 **Re-Synchronisation of Islands**

The **Re-Synchronisation** of parts of the **Total System** which have become **Out of Synchronism** with each other **irrespective of whether or not a** ~~but where there is no~~ **Total Shutdown** or **Partial Shutdown** **has occurred**.

OC9.1.3 **Joint System Incident Procedure**

The establishment of a communication route and arrangements between senior management representatives of **NGET** and **Users** involved in, or who may be involved in, an actual or potential serious or widespread disruption to the **Total System** or a part of the **Total System**, which requires, or may require, urgent managerial response, day or night, but which does not fall within the provisions of OC9.1.4.

OC9.1.4 It should be noted that under section 96 of the **Act** the **Secretary of State** may give directions to **NGET** and/or any **Generator** and/or any **Supplier**, for the purpose of "mitigating the effects of any civil emergency which may occur" (ie. for the purposes of planning for a civil emergency); a civil emergency is defined in the **Act** as "any natural disaster or other emergency which, in the opinion of the **Secretary of State**, is or may be likely to disrupt electricity supplies". Under the Energy Act 1976, the **Secretary of State** has powers to make orders and give directions controlling the production, supply, acquisition or use of electricity, where an Order in Council under section 3 is in force declaring that there is an actual or imminent emergency affecting electricity supplies. In the event that any such directions are given, or orders made under the **Energy Act 1976**, the provisions of the **Grid Code** will be suspended in so far as they are inconsistent with them.

OC9.1.5 **NGET** shall procure that **Relevant Transmission Licensees** shall comply with OC9.4 and OC9.5 and any relevant **Local Joint Restoration Plan** or **OC9 De-Synchronised Island Procedure** where and to the extent that such matters apply to them.

OC9.2 **OBJECTIVE**

The overall objectives of **OC9** are:

OC9.2.1 To achieve, as far as possible, restoration of the **Total System** and associated **Demand** in the shortest possible time, taking into account **Power Station** capabilities, including **Embedded Generating Units**,

External Interconnections and the operational constraints of the **Total System**.

OC9.2.2 To achieve the **Re-Synchronisation** of parts of the **Total System** which have become **Out of Synchronism** with each other.

OC9.2.3 To ensure that communication routes and arrangements are available to enable senior management representatives of **NGET** and **Users**, who are authorised to make binding decisions on behalf of **NGET** or the relevant **User**, as the case may be, to communicate with each other in the situation described in OC9.1.3.

OC9.2.4 To describe the role that in Scotland a **Relevant Transmission Licensee** may have in the restoration processes as detailed in the relevant **OC9 De-Synchronised Island Procedures** and **Local Joint Restoration Plans**.

OC9.2.5 To highlight that the restoration of the **Total System**, after a **Total Shutdown** or **Partial Shutdown**, is likely to require the following key processes to be implemented, typically, but not necessarily, in the order given below:

- i) Selectively implement **Local Joint Restoration Plans**
- ii) Expand **Power Islands** to supply **Power Station**
- iii) Expand and merge **Power Islands** leading to **Total System** energisation
- iv) Selectively reconnect **Demand**
- v) Facilitate and coordinate returning the **Total System** back to normal operation leading to the resumption of the **Balancing Mechanism**.

OC9.3 SCOPE

OC9.3.1 **OC9** applies to **NGET** and to **Users**, which in **OC9** means:-

- (a) **Generators**;
- (b) **Network Operators**; and
- (c) **Non-Embedded Customers**.

OC9.3.2 The procedure for the establishment of emergency support/contingency planning between **NGET** and **Externally Interconnected System Operators** is set out in the **Interconnection Agreement** with each **Externally Interconnected System Operator**.

OC9.3.3 In Scotland, OC9.4 and OC9.5 also apply to **Relevant Transmission Licensees**.

OC9.4 BLACK START

OC9.4.4 Total Shutdown and Partial Shutdown

OC9.4.1 A "**Total Shutdown**" is the situation existing when all generation has ceased and there is no electricity supply from **External Interconnections**. Therefore, the **Total System** has shutdown with the result that it is not possible for the **Total System** to begin to function again without **NGET's** directions relating to a **Black Start**.

OC9.4.2 Partial Shutdown

A "**Partial Shutdown**" is the same as a **Total Shutdown** except that all generation has ceased in a separate part of the **Total System** and there is no electricity supply from **External Interconnections** or other parts of the **Total System** to that part of the **Total System**. Therefore, that part of the **Total System** is shutdown with the result that it is not possible for that part of the **Total System** to begin to function again without **NGET's** directions relating to a **Black Start**.

OC9.4.3 During a **Total Shutdown** or **Partial Shutdown** and during the subsequent recovery, the **Licence Standards** may not apply and the **Total System** may be operated outside normal voltage and **Frequency** standards.

OC9.4.4 In a **Total Shutdown** and in a **Partial Shutdown** and during the subsequent recovery, it may be necessary for **NGET** to issue **Emergency Instructions** in accordance with BC2.9 and it may be necessary to depart from normal **Balancing Mechanism** operation in accordance with **BC2** in issuing **Bid-Offer Acceptances**.

OC9.4.5 Black Start Stations

OC9.4.5.1 Certain **Power Stations** ("**Black Start Stations**") are registered, pursuant to the **Bilateral Agreement** with a **User**, as having an ability for at least one of its **Gensets** to **Start-Up** from **Shutdown** and to energise a part of the **Total System**, or be **Synchronised** to the **System**, upon instruction from **NGET** within two hours, without an external electrical power supply ("**Black Start Capability**").

OC9.4.5.2 For each **Black Start Station**, a **Local Joint Restoration Plan** will be produced jointly by **NGET**, the relevant **Generator** and **Network Operator** in accordance with the provisions of OC9.4.7.14.2. The **Local Joint Restoration Plan** will detail the agreed method and procedure by which a **Genset** at a **Black Start Station** (possibly with other **Gensets** at that **Black Start Station**) will energise part of the **Total System** and meet complementary local **Demand** so as to form a **Power Island**.

OC9.4.5.3 In Scotland, a **Local Joint Restoration Plan** may cover more than one **Black Start Station** and may be produced with and include obligations on **Relevant Transmission Licensees**, **Generators** responsible for **Gensets** not at a **Black Start Station** and other **Users**.

OC9.4.6 Black Start Situation

In the event of a **Total Shutdown** or **Partial Shutdown**, **NGET** will, as soon as reasonably practical, inform **Users** (or, in the case of a **Partial Shutdown**, **Users** which in **NGET's** opinion need to be informed) and the **BSCCo** that a **Total Shutdown**, or, as the case may be, a **Partial Shutdown**, exists and that **NGET** intends to implement a **Black Start**.

In Scotland, in exceptional circumstances, as specified in the **Local Joint Restoration Plan**, the **Relevant Transmission Licensee**, may invoke such **Local Joint Restoration Plan** for its own **Transmission System** and operate within its provisions.

OC9.4.7 **Black Start**

OC9.4.7.1 The procedure necessary for a recovery from a **Total Shutdown** or **Partial Shutdown** is known as a "**Black Start**". The procedure for a **Partial Shutdown** is the same as that for a **Total Shutdown** except that it applies only to a part of the **Total System**. It should be remembered that a **Partial Shutdown** may affect parts of the **Total System** which are not themselves shutdown.

OC9.4.7.2 The complexities and uncertainties of recovery from a **Total Shutdown** or **Partial Shutdown** require that **OC9** is sufficiently flexible in order to accommodate the full range of **Genset** and **Total System** characteristics and operational possibilities, and this precludes the setting out in the **Grid Code** itself of concise chronological sequences. The overall strategy will, in general, include the overlapping phases of establishment of **Genset(s)** at an isolated **Power Station**, together with complementary local **Demand**, termed "**Power Islands**", step by step integration of these **Power Islands** into larger sub-systems **which includes utilising the procedures in OC9.5 (Re-Synchronisation of De-Synchronised Islands)** and eventually re-establishment of the complete **Total System**.

NGET Instructions

OC9.4.7.3 The procedures for a **Black Start** will, therefore, be those specified by **NGET** at the time. These will normally recognise any applicable **Local Joint Restoration Plan**. **Users** shall abide by **NGET's** instructions during a **Black Start** situation, even if these conflict with the general overall strategy outlined in OC9.4.7.2 or any applicable **Local Joint Restoration Plan**. **NGET's** instructions may (although this list should not be regarded as exhaustive) be to a **Black Start Station** relating to the commencement of generation, to a **Network Operator** or **Non-Embedded Customer** relating to the restoration of **Demand**, and to a **Power Station** relating to preparation for commencement of generation when an external power supply is made available to it, and in each case may include the requirement to undertake switching.

In Scotland the **Relevant Transmission Licensee** will act on **NGET's** behalf in accordance with its duties under the relevant **Local Joint Restoration Plan**. **Users** shall abide by the **Relevant Transmission Licensee's** instructions given in accordance with the **Local Joint Restoration Plan** during a **Black Start** situation.

OC9.4.7.4 (a) During a **Black Start** situation, instructions in relation to **Black Start Stations** and **Network Operators** will be **deemed to be in the format required for Emergency Instructions** in BC2.9, and will recognise any differing **Black Start** operational capabilities (however termed) set out in the relevant **Ancillary Services Agreement** in preference to the declared operational capability as registered pursuant to **BC1** (or as amended from time to time in accordance with the **BCs**). For the purposes of these

instructions the **Black Start** will be an emergency circumstance under BC2.9.

In Scotland, **Gensets** that are not at **Black Start Stations**, but which are part of a **Local Joint Restoration Plan**, may be instructed in accordance with the provisions of that **Local Joint Restoration Plan**.

During a **Black Start** situation, instructions in relation to ~~For Power Stations and Network Operators~~ which are not part of a **Local Joint Restoration Plan**, ~~Bid Offer Acceptances~~ will be deemed to be **Emergency Instructions** ~~recognise each BM Unit's Export and Import Limits and Dynamic Parameters as submitted pursuant to BC1 or BC2 (or as amended from time to time in accordance with the BC2.9e).~~ For the purposes of these instructions the **Black Start** will be an emergency circumstance under BC2.9.

- (b) If during the **Demand** restoration process any **Genset** cannot, because of the **Demand** being experienced, keep within its safe operating parameters, the **Generator** shall, unless a **Local Joint Restoration Plan** is in operation, inform **NGET**. **NGET** will, where possible, either instruct **Demand** to be altered or will re-configure the **GB Transmission System** or will instruct a **User** to re-configure its **System** in order to alleviate the problem being experienced by the **Generator**. If a **Local Joint Restoration Plan** is in operation, then the arrangements set out therein shall apply. However, **NGET** accepts that any decision to keep a **Genset** operating, if outside its safe operating parameters, is one for the **Generator** concerned alone and accepts that the **Generator** may change generation on that **Genset** if it believes it is necessary for safety reasons (whether relating to personnel or **Plant** and/or **Apparatus**). If such a change is made without prior notice, then the **Generator** shall inform **NGET** as soon as reasonably practical (unless a **Local Joint Restoration Plan** is in operation in which case the arrangements set out therein shall apply).

Embedded Power Stations

- OC9.4.7.5 Without prejudice to the provisions of OC9.4.7.8, **Network Operators** with **Embedded Power Stations** will comply with any directions of **NGET** to restore **Demand** to be met by the **Embedded Power Stations**.

Local Joint Restoration Plan operation

- OC9.4.7.6 (a) The following provisions apply in relation to a **Local Joint Restoration Plan**. As set out in OC9.4.7.3, **NGET** may issue instructions which conflict with a **Local Joint Restoration Plan**. In such cases, these instructions will take precedence over the requirements of the **Local Joint Restoration Plan**. When issuing such instructions, **NGET** shall state whether or not it wishes the remainder of the **Local Joint Restoration Plan** to apply. If, notwithstanding that **NGET** has stated that it wishes the remainder of the **Local Joint Restoration Plan** to apply, the **Generator** or the relevant **Network Operator** consider that **NGET's** instructions mean that it is not possible

to operate the **Local Joint Restoration Plan** as modified by those instructions, any of them may give notice to **NGET** and the other parties to the **Local Joint Restoration Plan** to this effect and **NGET** shall immediately consult with all parties to the **Local Joint Restoration Plan**. Unless all parties to the **Local Joint Restoration Plan** reach an agreement forthwith as to how the **Local Joint Restoration Plan** shall operate in those circumstances, operation in accordance with the **Local Joint Restoration Plan** will terminate.

- (b) Where **NGET**, as part of a **Black Start**, has given an instruction to a **Black Start Station** to initiate **Start-Up**, the relevant **Genset(s)** at the **Black Start Station** will **Start-Up** in accordance with the **Local Joint Restoration Plan**.
- (c) **NGET** will advise the relevant **Network Operator** of the requirement to switch its **User System** so as to segregate its **Demand** and to carry out such other actions as set out in the **Local Joint Restoration Plan**. The relevant **Network Operator** will then operate in accordance with the provisions of the **Local Joint Restoration Plan**.
- (d) **NGET** will ensure that switching carried out on the **GB Transmission System** and other actions are as set out in the **Local Joint Restoration Plan**.
- (e) Following notification from the **Generator** that the **Black Start Station** is ready to accept load, **NGET** will instruct the **Black Start Station** to energise part of the **Total System**. The **Black Start Station** and the relevant **Network Operator** will then, in accordance with the requirements of the **Local Joint Restoration Plan**, establish communication and agree the output of the relevant **Genset(s)** and the connection of **Demand** so as to establish a **Power Island**. During this period, the **Generator** will be required to regulate the output of the relevant **Genset(s)** at its **Black Start Station** to the **Demand** prevailing in the **Power Island** in which it is situated, on the basis that it will (where practicable) seek to maintain the **Target Frequency**. The **Genset(s)** at the **Black Start Station** will (where practical) also seek to follow the requirements relating to **Reactive Power** (which may include the requirement to maintain a target voltage) set out in the **Local Joint Restoration Plan**.
- (f) Operation in accordance with the **Local Joint Restoration Plan** will be terminated by **NGET** (by notifying the relevant **Users**) prior to connecting the **Power Island** to other **Power Islands** (other than, in Scotland, as allowed for in the **Local Joint Restoration Plan**), or to the **User System** of another **Network Operator**, or to the synchronising of **Gensets** at other **Power Stations** (other than, in Scotland, those forming part of the **Local Joint Restoration Plan**). Operation in accordance with the **Local Joint Restoration Plan** will also terminate in the circumstances provided for in OC9.4.7.6(a) if an agreement is not reached or if **NGET** states that it does not wish the remainder of the **Local Joint Restoration Plan** to apply. **Users** will then comply with the **Bid-Offer Acceptances** or **Emergency Instructions** of **NGET**.

- (g) In Scotland, **Gensets** included in a **Local Joint Restoration Plan**, but not at a **Black Start Station**, will operate in accordance with the requirements of the **Local Joint Restoration Plan**.

Interconnection of Power Islands

OC9.4.7.7 **NGET** will instruct the relevant **Users** so as to interconnect **Power Islands** to achieve larger sub-systems, and subsequently the interconnection of these sub-systems to form an integrated system. This should eventually achieve the re-establishment of the **Total System** or that part of the **Total System** subject to the **Partial Shutdown**, as the case may be. **Such interconnection of Power Islands and sub-systems will utilise the provisions of all or part of OC9.5 (Re-Synchronisation of De-synchronised Islands) and in such a situation such provisions will be part of the Black Start.**

OC9.4.7.8 As part of the **Black Start** strategy each **Network Operator** with either an **Embedded Black Start Station** which has established a **Power Island** within its **User System** or with any **Embedded Power Stations** within its **User System** which have become islanded, may in liaison with **NGET** sustain and expand these islands in accordance with the relevant provisions of OC9.5 which shall apply to this OC9.4 as if set out here. They will inform **NGET** of their actions and will not **Re-Synchronise** to the **GB Transmission System** or any **User's System** which is already **Synchronised** to the **GB Transmission System** without **NGET's** agreement.

~~Conclusion of Black Start~~ Return the Total System Back to Normal

Operation

OC9.4.7.9 ~~The conclusion of the Black Start, and the time of the return to normal operation of the Total System, will be determined by NGET who shall inform Users (or where there has been a Partial Shutdown, Users which in NGET's opinion need to be informed) that the Black Start situation no longer exists and that normal operation of the Total System has begun.~~ **NGET shall, as soon as reasonably practical, inform Users and the BSCCo when the Total System has returned to normal operation. Any such determination by NGET does not, of itself, mean that the provisions of paragraph 3 of Section G of the BSC shall cease to apply.**

In making the determination that the **Total System** could return to normal operation, **NGET**, would consider, amongst other things, the following areas:

- (a) the extent to which the **GB Transmission System** is contiguous and energised;
- (b) the integrity and stability of the **GB Transmission System** and its ability to operate in accordance with the **Licence Standards**;
- (c) the impact that returning to normal may have on transmission constraints and the corresponding ability to maximise the **Demand** connected; and
- (d) the volume of generation or **Demand** not connected to the **GB Transmission System**.

- (e) the functionality of normal communication systems (i.e. EDT, **Control Telephony**, etc).

For the avoidance of doubt, until the Conclusion of the **Black Start** the **Balancing Mechanism** is unlikely to be operational and **NGET** is likely to continue to issue **Emergency Instructions** in accordance with BC2.9.

Conclusion of **Black Start**

- OC9.4.7.10 With effect from the time when the **BSCCo** has confirmed that the provisions of Section G, paragraph 3 are to cease to apply and that the **Balancing Mechanism** is re-established the **Black Start** will conclude and hence operation in accordance with the provisions of this OC9 shall cease.

Externally Interconnected System Operators

- OC9.4.7.10¹ During a **Black Start**, **NGET** will, pursuant to the **Interconnection Agreement** with **Externally Interconnected System Operators**, agree with **Externally Interconnected System Operators** when their transmission systems can be **Re-Synchronised** to the **Total System**, if they have become separated.

- OC9.4.7.14² **Local Joint Restoration Plan** establishment

- (a) In England and Wales, in relation to each **Black Start Station**, **NGET**, the **Network Operator** and the relevant **Generator** will discuss and agree a **Local Joint Restoration Plan**. Where at the date of the first inclusion of this OC9.4.7.14² into the **Grid Code** a local plan covering the procedures to be covered in a **Local Joint Restoration Plan** is in existence and agreed, **NGET** will discuss this with the **Network Operator** and the relevant **Generator** to agree whether it is consistent with the principles set out in this OC9.4. If it is agreed to be so consistent, then it shall become a **Local Joint Restoration Plan** under this OC9 and the relevant provisions of OC9.4.7.14²(b) shall apply. If it is not agreed to be so consistent, then the provisions of OC9.4.7.14²(b) shall apply as if there is no **Local Joint Restoration Plan** in place.

In Scotland where a requirement for a **Local Joint Restoration Plan** is identified, **NGET**, the **Relevant Transmission Licensee**, the **Network Operator** and **Black Start Station(s)** will discuss and agree a **Local Joint Restoration Plan**. In addition other **Users**, including other **Generators**, may be reasonably required by **NGET** to discuss and agree a **Local Joint Restoration Plan**.

- (b) In England and Wales, where the need for a **Local Joint Restoration Plan** arises when there is none in place, the following provisions shall apply:-
 - (i) **NGET**, the **Network Operator** and the relevant **Generator** will discuss and agree the detail of the **Local Joint Restoration Plan** as soon as the requirement for a **Local Joint Restoration Plan** is identified by **NGET**.

- NGET** will notify all affected **Users**, and will initiate these discussions.
- (ii) Each **Local Joint Restoration Plan** will be in relation to a specific **Black Start Station**.
 - (iii) The **Local Joint Restoration Plan** will record which **Users** and which **User Sites** are covered by the **Local Joint Restoration Plan** and set out what is required from **NGET** and each **User** should a **Black Start** situation arise.
 - (iv) Each **Local Joint Restoration Plan** shall be prepared by **NGET** to reflect the above discussions and agreement.
 - (v) Each page of the **Local Joint Restoration Plan** shall bear a date of issue and the issue number.
 - (vi) When a **Local Joint Restoration Plan** has been prepared, it shall be sent by **NGET** to the **Users** involved for confirmation of its accuracy.
 - (vii) The **Local Joint Restoration Plan** shall then (if its accuracy has been confirmed) be signed on behalf of **NGET** and on behalf of each relevant **User** by way of written confirmation of its accuracy.
 - (viii) Once agreed under this OC9.4.7.14~~2~~, the procedure will become a **Local Joint Restoration Plan** under the **Grid Code** and (subject to any change pursuant to this OC9) will apply between **NGET** and the relevant **Users** as if it were part of the **Grid Code**.
 - (ix) Once signed, a copy of the **Local Joint Restoration Plan** will be distributed by **NGET** to each **User** which is a party to it accompanied by a note indicating the date of implementation.
 - (x) **NGET** and **Users** must make the **Local Joint Restoration Plan** readily available to the relevant operational staff.
 - (xi) If **NGET**, or any **User** which is a party to a **Local Joint Restoration Plan**, becomes aware that a change is needed to that **Local Joint Restoration Plan**, it shall (in the case of **NGET**) initiate a discussion between **NGET** and the relevant **Users** to seek to agree the relevant change. If a **User** becomes so aware, it shall contact **NGET** who will then initiate such discussions. The principles applying to establishing a new **Local Joint Restoration Plan** under this OC9.4.7.12~~4~~ shall apply to such discussions and to any consequent changes.
 - (xii) **NGET, the Network Operator and the relevant Generator will conduct regular joint exercises of the Local Joint Restoration Plan to which they are parties. The objectives of such exercises include:**

- To test the effectiveness of the **Local Joint Restoration Plan**;
- To provide for joint training of the parties in respect of the **Local Joint Restoration Plan**;
- To maintain the parties' awareness and familiarity of the **Local Joint Restoration Plan**;
- To promote understanding of each parties' roles under a **Local Joint Restoration Plan**;
- To identify any improvement areas which should be incorporated in to the **Local Joint Restoration Plan**.
- The principles applying to the establishment of a new **Local Joint Restoration Plan** under this OC9.4.7.12 shall apply to any changes to the **Local Joint Restoration Plan**.

NGET will propose to the parties of a **Local Joint Restoration Plan** a time for the exercise to take place, to be agreed with the other parties. All the **Local Joint Restoration Plan** parties will jointly share the task of planning, preparing, participating in and facilitating the exercises, which will normally be in desktop format or as otherwise agreed. The precise timing of the exercise for each **Local Joint Restoration Plan** will be agreed by all parties, but will not be less than one every 8 years.

- (c) In Scotland, where the need for a **Local Joint Restoration Plan** arises, the following provisions shall apply:-
- (i) **NGET**, the **Relevant Transmission Licensee**, the **Network Operator** and the relevant **Generator** will discuss and agree the detail of the **Local Joint Restoration Plan** as soon as the requirement for a **Local Joint Restoration Plan** is identified by **NGET**. In addition other **Users**, including other **Generators**, may be reasonably required by **NGET** to discuss and agree details of the **Local Joint Restoration Plan** as soon as the requirement for a **Local Joint Restoration Plan** is identified by **NGET**. **NGET** will notify the **Relevant Transmission Licensee** and all affected **Users**, and will initiate these discussions.
 - (ii) Each **Local Joint Restoration Plan** may be in relation to either a specific **Black Start Station** or a number of **Black Start Stations**, and may include **Gensets** at **Power Stations** other than a **Black Start Station**.
 - (iii) The **Local Joint Restoration Plan** will record which **Users** and which **User Sites** are covered by the **Local Joint Restoration Plan** and set out what is required from **NGET**, the **Relevant Transmission Licensee** and each **User** should a **Black Start** situation arise.
 - (iv) Each **Local Joint Restoration Plan** shall be prepared by **NGET** to reflect the above discussions and agreement.
 - (v) Each page of the **Local Joint Restoration Plan** shall bear a date of issue and the issue number.

- (vi) When a **Local Joint Restoration Plan** has been prepared, it shall be sent by **NGET** to the **Relevant Transmission Licensee** and **Users** involved for confirmation of its accuracy.
- (vii) The **Local Joint Restoration Plan** shall then (if its accuracy has been confirmed) be signed on behalf of **NGET** and on behalf of each relevant **User** and **Relevant Transmission Licensee** by way of written confirmation of its accuracy.
- (viii) Once agreed under this OC9.4.7.14², the procedure will become a **Local Joint Restoration Plan** under the **Grid Code** and (subject to any change pursuant to this **OC9**) will apply between **NGET**, **Relevant Transmission Licensee** and the relevant **Users** as if it were part of the **Grid Code**.
- (ix) Once signed, a copy of the **Local Joint Restoration Plan** will be distributed by **NGET** to the **Relevant Transmission Licensee** and each **User** which is a party to it accompanied by a note indicating the date of implementation.
- (x) **NGET**, the **Relevant Transmission Licensee** and **Users** must make the **Local Joint Restoration Plan** readily available to the relevant operational staff.
- (xi) If **NGET**, the **Relevant Transmission Licensee** or any **User** which is a party to a **Local Joint Restoration Plan**, becomes aware that a change is needed to that **Local Joint Restoration Plan**, it shall (in the case of **NGET**) initiate a discussion between **NGET**, the **Relevant Transmission Licensee** and the relevant **Users** to seek to agree the relevant change. If a **User** or the **Relevant Transmission Licensee** becomes so aware, it shall contact **NGET** who will then initiate such discussions. The principles applying to establishing a new **Local Joint Restoration Plan** under this OC9.4.7.14² shall apply to such discussions and to any consequent changes.
- (xii) **NGET**, the **Relevant Transmission Licensee(s)**, the **Network Operator** and the relevant **Generator** will conduct regular joint exercises of the **Local Joint Restoration Plan** to which they are parties. The objectives of such exercises include:
- To test the effectiveness of the **Local Joint Restoration Plan**;
 - To provide for joint training of the parties in respect of the **Local Joint Restoration Plan**;
 - To maintain the parties' awareness and familiarity of the **Local Joint Restoration Plan**;
 - To promote understanding of each parties' roles under a **Local Joint Restoration Plan**;
 - To identify any improvement areas which should be incorporated in to the **Local Joint Restoration Plan**.

- The principles applying to the establishment of a new **Local Joint Restoration Plan** under this OC9.4.7.12 shall apply to any changes to the **Local Joint Restoration Plan**.

NGET will propose to the parties of a **Local Joint Restoration Plan** a time for the exercise to take place, to be agreed with the other parties. All the **Local Joint Restoration Plan** parties will jointly share the task of planning, preparing, participating in and facilitating the exercises, which will normally be in desktop format or as otherwise agreed. The precise timing of the exercise for each **Local Joint Restoration Plan** will be agreed by all parties, but will not be less than one every 8 years.

OC9.5 RE-SYNCHRONISATION OF DE-SYNCHRONISED ISLANDS

The provisions in this OC9.5 do not apply to the parts of the **Total System** that normally operate **Out of Synchronism** with the rest of the **GB Transmission System**.

Further requirements, including the provision of information, applying to **Re-synchronisation of De-synchronised Islands** following any **Total Shutdown** or **Partial Shutdown** are detailed in OC9.5.6.

- OC9.5.1
- (a) Where parts of the **Total System** are **Out of Synchronism** with each other (each such part being termed a "**De-Synchronised Island**"), but there is no **Total Shutdown** or **Partial Shutdown**, **NGET** will instruct **Users** to regulate generation or **Demand**, as the case may be, to enable the **De-Synchronised Islands** to be **Re-Synchronised** and **NGET** will inform those **Users** when **Re-Synchronisation** has taken place.
 - (b) As part of that process, there may be a need to deal specifically with **Embedded** generation in those **De-Synchronised Islands**. This OC9.5 provides for how such **Embedded** generation should be dealt with. In Scotland, this OC9.5 also provides for how **Transmission** connected generation in **De-Synchronised Islands** should be dealt with.
 - (c) In accordance with the provisions of the **BCs**, **NGET** may decide that, to enable **Re-Synchronisation**, it will issue **Emergency Instructions** in accordance with BC2.9 and it may be necessary to depart from normal **Balancing Mechanism** operation in accordance with **BC2** in issuing **Bid-Offer Acceptances**.
 - (d) The provisions of this OC9.5 shall also apply **during a Black Start** to the **Re-Synchronising** of parts of the **System** following a **Total** or **Partial Shutdown**, as indicated in OC9.4. In such cases, the provisions of the OC9.5 shall apply following completion and/or termination of the relevant **Local Joint Restoration Plan(s)** process as referred to in OC9.4.7.6(f).

OC9.5.2 Options

Generation in those **De-Synchronised Islands** may be dealt with in three different ways, more than one of which may be utilised in relation to any particular incident:-

OC9.5.2.1 Indirect Data

- (a) **NGET**, each **Generator** with **Synchronised** (or connected and available to generate although not **Synchronised**) **Genset(s)** in the **De-Synchronised Island** and the **Network Operator** whose **User System** forms all or part of the **De-Synchronised Island** shall exchange information as set out in this OC9.5.2.1 to enable **NGET** to issue a **Bid-Offer Acceptance** or an **Emergency Instruction** to that **Generator** in relation to its **Genset(s)** in the **De-Synchronised Island** until **Re-Synchronisation** takes place, on the basis that it will (where practicable) seek to maintain the **Target Frequency**.
- (b) The information to **NGET** from the **Generator** will cover its relevant operational parameters as outlined in the **BCs** and from **NGET** to the **Generator** will cover data on **Demand** and changes in **Demand** in the **De-Synchronised Island**.
- (c) The information from the **Network Operator** to **NGET** will comprise data on **Demand** in the **De-Synchronised Island**, including data on any constraints within the **De-Synchronised Island**.
- (d) **NGET** will keep the **Network Operator** informed of the **Bid-Offer Acceptances** or **Emergency Instructions** it is issuing to **Embedded Genset(s)** within the **Network Operator's User System** forming part of the **De-Synchronised Island**.

OC9.5.2.2 Direct Data

- (a) **NGET** will issue an **Emergency Instruction** and/or a **Bid-Offer Acceptance**, to the **Generator** to "float" local **Demand** and maintain **Frequency** at **Target Frequency**. Under this the **Generator** will be required to regulate the output of its **Genset(s)** at the **Power Station** in question to the **Demand** prevailing in the **De-Synchronised Island** in which it is situated, until **Re-Synchronisation** takes place, on the basis that it will (where practicable) seek to maintain the **Target Frequency**.
- (b) The **Network Operator** is required to be in contact with the **Generator** at the **Power Station** to supply data on **Demand** changes within the **De-Synchronised Island**.
- (c) If more than one **Genset** is **Synchronised** on the **De-Synchronised Island**, or is connected to the **De-Synchronised Island** and available to generate although not **Synchronised**, the **Network Operator** will need to liaise with **NGET** to agree which **Genset(s)** will be utilised to accommodate changes in **Demand** in the **De-Synchronised Island**. The **Network Operator** will then maintain contact with

the relevant **Generator** (or **Generators**) in relation to that **Genset(s)**.

- (d) The **Generator** at the **Power Station** must contact the **Network Operator** if the level of **Demand** which it has been asked to meet as a result of the **Emergency Instruction** and/or **Bid-Offer Acceptance** to "float" and the detail on **Demand** passed on by the **Network Operator**, is likely to cause problems for safety reasons (whether relating to personnel or **Plant** and/or **Apparatus**) in the operation of its **Genset(s)**, in order that the **Network Operator** can alter the level of **Demand** which that **Generator** needs to meet. Any decision to operate outside any relevant parameters is one entirely for the **Generator**.

OC9.5.2.3 Control Features

- (a) A system may be established in relation to a part of the **GB Transmission System** and a **Network Operator's User System**, if agreed between **NGET** and the **Network Operator** and any relevant **Generator(s)**, whereby upon a defined fault(s) occurring, manual or automatic control features will operate to protect the **GB Transmission System** and relevant **Network Operator's User System** and **Genset(s)** and simplify the restoration of **Demand** in the **De-Synchronised Island**.
- (b) In agreeing the establishment of such a system of control features **NGET** will need to consider its impact on the operation of the **GB Transmission System**.

OC9.5.2.4 Absence of Control Features System

If a system of control features under OC9.5.2.3 has not been agreed as part of an **OC9 De-Synchronised Island Procedure** under OC9.5.4 below, **NGET** may choose to utilise the procedures set out in OC9.5.2.1 or OC9.5.2.2, or may instruct the **Genset(s)** (or some of them) in the **De-Synchronised Island** to **De-Synchronise**.

OC9.5.3 Choice of Option

In relation to each of the methods set out in OC9.5.2, where a **De-Synchronised Island** has come into existence and where an **OC9 De-Synchronised Island Procedure** under OC9.5.4 has been agreed, **NGET**, the **Network Operator** and relevant **Generator(s)** will operate in accordance with that **OC9 De-Synchronised Islands Procedure** unless **NGET** considers that the nature of the **De-Synchronised Island** situation is such that either:-

- (i) the **OC9 De-Synchronised Island Procedure** does not cover the situation; or
- (ii) the provisions of the **OC9 De-Synchronised Island Procedure** are not appropriate,

in which case **NGET** will instruct the relevant **Users** and the **Users** will comply with **NGET's** instructions (which in the case of **Generators** will

relate to generation and in the case of **Network Operators** will relate to **Demand**).

OC9.5.4 Agreeing Procedures

In relation to each relevant part of the **Total System**, **NGET**, the **Network Operator** and the relevant **Generator** will discuss and may agree a local procedure (an "**OC9 De-Synchronised Island Procedure**").

OC9.5.4.1 Where there is no relevant local procedure in place at 12th May 1997, or in the case where the need for an **OC9 De-Synchronised Island Procedure** arises for the first time, the following provisions shall apply:-

- (a) **NGET**, the **Network Operator(s)** and the relevant **Generator(s)** will discuss the need for, and the detail of, the **OC9 De-Synchronised Island Procedure**. As soon as the need for an **OC9 De-Synchronised Island Procedure** is identified by **NGET** or a **User**, and the party which identifies such a need will notify all affected **Users** (and **NGET**, if that party is a **User**), and **NGET** will initiate these discussions.
- (b) Each **OC9 De-Synchronised Island Procedure** will be in relation to a specific **Grid Supply Point**, but if there is more than one **Grid Supply Point** between **NGET** and the **Network Operator** then the **OC9 De-Synchronised Island Procedure** may cover all relevant **Grid Supply Points**. In Scotland, the **OC9 De-Synchronised Island Procedure** may also cover parts of the **GB Transmission System** connected to the **User's System(s)** and **Power Stations** directly connected to the **GB Transmission System** which are also likely to form part of the **Power Island**.
- (c) The **OC9 De-Synchronised Island Procedure** will:-
 - (i) record which **Users** and which **User Sites** are covered by the **OC9 De-Synchronised Island Procedure**;
 - (ii) record which of the three methods set out in OC9.5 (or combination of the three) shall apply, with any conditions as to applicability being set out as well;
 - (iii) set out what is required from **NGET** and each **User** should a **De-Synchronised Island** arise;
 - (iv) set out what action should be taken if the **OC9 De-Synchronised Island Procedure** does not cover a particular set of circumstances and will reflect that in the absence of any specified action, the provisions of OC9.5.3 will apply;
 - (v) in Scotland, the **OC9 De-Synchronised Island Procedure** may be produced with and include obligations on the **Relevant Transmission Licensee** ; and
 - (vi) in Scotland, where the **OC9 De-Synchronised Island Procedure** includes the establishment of a **De-**

synchronised Island, describe the route for establishment of the **De-Synchronised Island**.

- (d) Each **OC9 De-Synchronised Island Procedure** shall be prepared by **NGET** to reflect the above discussions.
- (e) Each page of the **OC9 De-Synchronised Island Procedure** shall bear a date of issue and the issue number.
- (f) When an **OC9 De-Synchronised Island Procedure** is prepared, it shall be sent by **NGET** to the **Users** involved for confirmation of its accuracy.
- (g) The **OC9 De-Synchronised Island Procedure** shall then be signed on behalf of **NGET** and on behalf of each relevant **User** by way of written confirmation of its accuracy.
- (h) Once agreed under this OC9.5.4.1, the procedure will become an **OC9 De-Synchronised Island Procedure** under the **Grid Code** and (subject to any change pursuant to this OC9) will apply between **NGET**, **Relevant Transmission Licensee** and the relevant **Users** as if it were part of the **Grid Code**.
- (i) Once signed, a copy will be distributed by **NGET** to each **User** which is a party accompanied by a note indicating the issue number and the date of implementation.
- (j) **NGET** and **Users** must make the **OC9 De-Synchronised Island Procedure** readily available to the relevant operational staff.
- (k) If a new **User** connects to the **Total System** and needs to be included with an existing **OC9 De-Synchronised Island Procedure**, **NGET** will initiate a discussion with that **User** and the **Users** which are parties to the relevant **OC9 De-Synchronised Island Procedure**. The principles applying to a new **OC9 De-Synchronised Island Procedure** under this OC9.5.4.1 shall apply to such discussions and to any consequent changes.
- (l) If **NGET**, or any **User** which is a party to an **OC9 De-Synchronised Island Procedure**, becomes aware that a change is needed to that **OC9 De-Synchronised Island Procedure**, it shall (in the case of **NGET**) initiate a discussion between **NGET** and the relevant **Users** to seek to agree the relevant change. The principles applying to establishing a new **OC9 De-Synchronised Island Procedure** under this OC9.5.4.1 shall apply to such discussions and to any consequent changes. If a **User** becomes so aware, it shall contact **NGET** who will then initiate such discussions.
- (m) If in relation to any discussions, agreement cannot be reached between **NGET** and the relevant **Users**, **NGET** will operate the **System** on the basis that it will discuss which of the three methods set out in OC9.5.2.1 to OC9.5.2.3 would be most appropriate at the time, if practicable. The complexities and uncertainties of recovery from a **De-Synchronised Island** means that **NGET** will decide, having discussed the situation

with the relevant **Users** and taking into account the fact that the three methods may not cover the situation or be appropriate, the approach which is to be followed. **NGET** will instruct the relevant **Users** and the **Users** will comply with **NGET's** instructions as provided in OC9.5.3.

OC9.5.4.2 Where there is a relevant local procedure in place at 12th May 1997, the following provisions shall apply:-

- (a) **NGET** and the **Network Operator** and the relevant **Generator(s)** will discuss the existing procedure to see whether it is consistent with the principles set out in this OC9.5.
- (b) If it is, then it shall become an **OC9 De-Synchronised Island Procedure** under this OC9, and the relevant provisions of OC9.5.4.1 shall apply.
- (c) If it is not, then the parties will discuss what changes are needed to ensure that it is consistent, and once agreed the procedure will become an **OC9 De-Synchronised Island Procedure** under this OC9, and the relevant provisions of OC9.5.4.1 shall apply.
- (d) If agreement cannot be reached between **NGET** and the relevant **Users** after a reasonable period of time, the existing procedure will cease to apply and **NGET** will operate the **System** on the basis that it will discuss which of the three methods set out in OC9.5.2.1 to OC9.5.2.3 would be most appropriate at the time, if practicable. The complexities and uncertainties of recovery from a **De-Synchronised Island** means that **NGET** will decide, having discussed the situation with the relevant **Users** and taking into account the fact that the three methods may not cover the situation or be appropriate, the approach which is to be followed. **NGET** will instruct the relevant **Users** and the **Users** will comply with **NGET's** instructions as provided in OC9.5.3.

OC9.5.5 Where the **GB Transmission System** is **Out of Synchronism** with the transmission system of an **Externally Interconnected System Operator**, **NGET** will, pursuant to the **Interconnection Agreement** with that **Externally Interconnected System Operator**, agree with that **Externally Interconnected System Operator** when its transmission system can be **Re-Synchronised** to the **GB Transmission System**.

OC9.5.6 Further requirements regarding **Re-synchronisation of De-synchronised Islands** following any **Total Shutdown or Partial Shutdown**

Following any **Total Shutdown or Partial Shutdown** **NGET** expects that it will be necessary to interconnect **Power Islands** utilising the provisions of OC9.5. The complexities and uncertainties of recovery from a **Total Shutdown or Partial Shutdown** requires the provisions of OC9.5 to be flexible, however, the strategies which **NGET** will, where practicable, be seeking to follow when **Re-synchronising De-**

synchronised Islands following any **Total Shutdown** or **Partial Shutdown**, include the following:

- a) the provision of supplies to appropriate **Power Stations** to facilitate their synchronisation as soon as practicable;
- b) energisation of a skeletal **GB Transmission System**;
- c) the strategic restoration of **Demand** in coordination with relevant **Network Operators**.

As highlighted in OC9.4.3, during a **Total Shutdown** or **Partial Shutdown** and during the subsequent recovery, which includes any period during which the procedures in this OC9.5 apply, the **Licence Standards** may not apply and the **Total System** may be operated outside normal voltage and **Frequency** standards.

OC9.5.7 To manage effectively and coordinate the restoration strategies of the **Total System** (any **Re-Synchronisation** of **De-Synchronised Islands**) following any **Total Shutdown** or **Partial Shutdown**, requires **NGET** and relevant **Users** to undertake certain planning activities as set out below:

- a) **NGET** and **Network Operators** shall review on a regular basis the processes by which each **Power Island** will be interconnected. This is likely to cover an exchange of information regarding the typical size, location and timing requirements for **Demand** to be reconnected and also include details (ability to change/disable) of the low frequency trip relay settings of the **Demand** identified.
- b) Each **Generator** shall provide to **NGET** information to assist **NGET** in the formulation of the restoration strategies of **Power Island** expansion. This information shall be provided in accordance with PC.A.5.7.

Proposed Changes to BC2 (Post Gate Closure Process)

BC2.9.2 Implementation of **Emergency Instructions**

BC2.9.2.1 **Users** will respond to **Emergency Instructions** issued by **NGET** without delay and using all reasonable endeavours to so respond. **Emergency Instructions** may only be rejected by an **User** on safety grounds (relating to personnel or plant) and this must be notified to **NGET** immediately by telephone.

BC2.9.2.2 **Emergency Instructions** will always be prefixed with the words “This is an **Emergency Instruction**” except:

- (i) in the case of **Maximum Generation Service** instructed by electronic data communication facilities where the instruction will be issued in accordance with the provisions of the **Maximum Generation Service Agreement**; and
- (ii) during a **Black Start** any instruction given by **NGET** will (unless **NGET** specifies otherwise) be deemed to be an **Emergency Instruction** and need not be prefixed with the words “This is an **Emergency Instruction**”.

BC2.9.2.3 In all cases under this BC2.9 except BC2.9.1.2 (e) where **NGET** issues an **Emergency Instruction** to a **BM Participant** which is not rejected under BC2.9.2.1, the **Emergency Instruction** shall be treated as a **Bid-Offer Acceptance**. For the avoidance of doubt, any **Emergency Instruction** issued to a **Network Operator** or to an **Externally Interconnected System Operator** or in respect of a **Generating Unit** that does not form part of a **BM Unit**, will not be treated as a **Bid-Offer Acceptance**.

BC2.9.2.4 In the case of BC2.9.1.2 (e) (ii) where **NGET** issues an **Emergency Instruction** pursuant to a **Maximum Generation Service Agreement** payment will be dealt with in accordance with the **CUSC** and the **Maximum Generation Service Agreement**.

BC2.9.2.5 In the case of BC2.9.1.2 (e) (i) upon receipt of an **Emergency Instruction** by a **Generator** during a **Black Start** the provisions of Section G of the **BSC** shall apply.

Proposed Changes to Glossary and Definitions

Local Joint Restoration Plan A plan produced under OC9.4.7.124 detailing the agreed method and procedure by which a **Genset** at a **Black Start Station** (possibly with other **Gensets** at that **Black Start Station**) will energise part of the **Total System** and meet complementary blocks of local **Demand** so as to form a **Power Island**.

In Scotland, the plan may also: cover more than one **Black Start Station**; include **Gensets** other than those at a **Black Start Station** and cover the creation of one or more **Power Islands**.

Re-synchronised The bringing of parts of the ~~Network Operator's User System~~ which have become **Out of Synchronism** with ~~each~~any other **System** back into **Synchronism**, and like terms shall be construed accordingly.

Proposed Changes to Planning Code

PC.A.5 **GENERATING UNIT, POWER PARK MODULE AND DC CONVERTER DATA**

PC.A.5.1 Introduction

Directly Connected

PC.A.5.1.1 Each **Generator**, with existing or proposed **Power Stations** directly connected, or to be directly connected, to the **GB Transmission System**, shall provide **NGET** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3, ~~and~~PC.A.5.4 and **PC.A.5.7** as applicable. Each **DC Converter Station** owner, with existing or proposed **DC Converter Stations** directly connected, or to be directly connected, to the **GB Transmission System**, shall provide **NGET** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4.

Embedded

PC.A.5.1.2 Each **Generator**, 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** not subject to a **Bilateral Agreement** within its **System** shall provide **NGET** with data relating to each of those **Large Power Stations** and **Medium Power Stations**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3, ~~and~~PC.A.5.4 and **PC.A.5.7** as applicable. Each **DC Converter Station** owner, or **Network Operator** in the case of an **Embedded DC Converter Station** not subject to a **Bilateral Agreement** within its **System** with existing or proposed **DC Converter Stations** shall provide **NGET** 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 **NGET** under PC.A.5.1.4.

Insert new paragraph after PC.A.5.6

PC.A.5.7 **Black Start Related Information**

Data identified under this section PC.A.5.7 must be submitted as required under PC.A.1.2. This information may also be requested by **NGET** during a **Black Start** and should be provided by **Generators** where reasonably possible. **Generators** in this section PC.A.5.7 means **Generators** only in respect of their **Large Power Stations**.

The following data items/text must be supplied, from each **Generator** to **NGET**, with respect to each **BM Unit** at a **Large Power Station** (excluding the **Generating Units** that are contracted to provide **Black Start Capability**, **Power Park Modules** or **Generating Units** with an **Intermittent Power Source**);

- (a) Expected time for each **BM Unit** to be **Synchronised** following a **Total Shutdown** or **Partial Shutdown**. The assessment should include the **Power Station's** ability to re-synchronise all **BM Units**, if all were running immediately prior to the **Total Shutdown** or **Partial Shutdown**. Additionally this should highlight any specific issues (i.e. those that would impact on the **BM Unit's** time to be **Synchronised**) that may arise, as time progresses without external supplies being restored.
- (b) Block loading capability. This should be provided in either graphical or tabular format showing the estimated block loading capability from 0MW to **Registered Capacity**. Any particular 'hold' points should also be identified. The data of each **BM Unit** should be provided for the condition of a 'hot' unit that was **Synchronised** just prior to the **Total Shutdown** or **Partial Shutdown** and also for the condition of a 'cold' unit. The block loading assessment should be done against a frequency variation of 49.5Hz – 50.5Hz.

Proposed Changes to Data Registration Code

Insert new paragraph after DRC.6.1.15

DRC.6.1.16 **SCHEDULE 16 – BLACK START INFORMATION**

Comprising information relating to Black Start.

Amendment DRC.6.2 as follows:

DRC.6.2 The **Schedules** applicable to each class of **User** are as follows:

Generators with Large Power Station Sched 1, 2, 3, 4, 9, 14, 15, 16

Proposed Changes to Data Registration Code

Insert new Schedule 16 as follows

BLACK START INFORMATION

The following data/text items are required from each **Generator** for each **BM Unit** at a **Large Power Station** as detailed in PC.A.5.7. Data is not required for **Generating Units** that are contracted to provide **Black Start Capability, Power Park Modules or Generating Units** that have an **Intermittent Power Source**. The data should be provided in accordance with PC.A.1.2 and also, where possible, upon request from **NGET** during a **Black Start**.

Data Description	Units	Data Category
Assuming all BM Units were running immediately prior to the Total Shutdown or Partial Shutdown and in the event of loss of all external power supplies, provide the following information:		
a) Expected time for the first and subsequent BM Units to be Synchronised , from the restoration of external power supplies, assuming external power supplies are not available for up to 24hrs	Tabular or Graphical	DPD
b) Describe any likely issues that would have a significant impact on a BM Unit's time to be Synchronised arising as a direct consequence of the inherent design or operational practice of the Power Station and/or BM Unit , e.g. limited barring facilities, time from a Total Shutdown or Partial Shutdown at which batteries would be discharged.	Text	DPD
Block Loading Capability:		
c) Provide estimated Block Loading capability from 0MW to Registered Capacity of each BM Unit based on the unit being 'hot' (run prior to shutdown) and also 'cold' (not run for 48hrs or more prior to the shutdown). The Block Loading capability should be valid for a frequency deviation of 49.5 Hz – 50.5Hz. The data should identify any required 'hold' points.	Tabular or Graphical	DPD

APPENDIX B: EXECUTIVE SUMMARY OF E3C BLACK START REVIEW REPORT

Black Start Review and Exercise Programme



The Review:

**Summary of the Report to the
Energy Emergencies Executive**

Chris Mortley

Energy Emergencies Executive Committee



May 2006

Engagement with industry and HMG departments

All electricity supply industry (ESI) participant companies, and their Trade Associations, have been fully supportive of the measures taken to enquire into capability and to examine opportunities for improvement. Government departments have demonstrated a keen (and growing) interest in the issues associated with Total Shutdown and Black Start, in the context of their own contingency planning arrangements.

All Black Start participant companies collaborated in the completion of a detailed questionnaire on capability (on the basis that the confidentiality of individual responses would be protected). In addition to disclosing variable capabilities, completion of the questionnaire has caused companies to identify opportunities for introducing improvements in procedures and facilitation.

Existing Black Start Plans and ESI capability

The existing approach to Black Start is sound in concept, but prospective performance is jeopardized by:

- Weaknesses in process arrangements, particularly at locations subject to activity overload and at the power station/distribution network operator interface. Ⓢ 2006 - improvements are noted as a result of Exercise Phoenix.
- Dependence by ESI companies on a range of telecommunications services of uncertain resilience. Ⓢ 2006 - a joint DTI/ESI group is reviewing telecommunications resilience.
- Uncertainties about the availability of gas supplies to gas-fired power stations following Total Shutdown.
- Uncertainties about the performance of supervisory control and data acquisition (SCADA) systems.

Return to normal times

Reasonable target time for resumption of unconstrained electricity supply to all customers has been established as 48 hours in summer and 72 hours in winter (subject to the absence of underlying asset damage requiring long repair time).

Sequence of restoration

The strategy of seeking to re-energize the Great Britain transmission system as quickly as possible, to enable power station interconnection, has been validated. This provides for the broadly concurrent development of up to seven power zones, each serving major conurbations. The technical characteristics of small Black Start capable hydro power stations in Scotland means that the first restorations are likely to occur there; but sustained restoration of the country as a whole would be jeopardized if a focus was placed on accelerated restoration of any particular conurbation, including London, bearing in mind that the south-east as a whole requires infeed from remotely located sources of generation.

Opportunities for improvement

Insofar that the over-arching approach to Black Start, and the national availability and disposition of Black Start power stations, is considered sound, it is nonetheless evident that Black Start capability has been (prior to Exercise Phoenix) relatively poorly understood in some parts of the industry, and the most effective area for improvement lies in the regular review, development, and practice of processes and procedures. Other opportunities are associated with introduction of more demanding performance standards for auxiliary systems e.g. substation batteries, telecoms systems, etc.

Investment proposals

Black Start recovery process: BSTG has not identified opportunities for major capital investment by any of the Black Start participant companies. However, reinforcement of second-order systems (e.g. resilient telecommunications and SCADA systems, and information systems serving the needs of HMG departments, the media and the public) would improve overall Black Start capability.

Primary fuel supplies: It may yet arise that following further analysis of gas production and delivery capability, in the circumstances of GB Total Shutdown, justifiable opportunities for capital investment will be identified in the up-stream gas supply chain i.e. provision of greater resilience at gas terminal sites.

Consequences arising from Total Shutdown

Although not a primary objective of the Black Start Review and Exercise Programme, engagement with other HMG Departments and public service agencies has featured prominently. It has become evident that there are fundamental weaknesses in the perception of not only the national consequences arising from Total Shutdown (and therefore weaknesses arising from any wide-area and prolonged power outage), but also in the capability of the ESI in recovering from such conditions.

Exercise Phoenix

All Black Start participant companies contributed to the delivery of over 100 separate preparation and exercise/training modules, at multiple locations around the country, during spring 2006. About 1,100 man-days of commitment were registered, and the salary costs of preparation and delivery exceeded £0.5 million. This has been a remarkable example of pan-industry collaboration, without recent precedent.

The conclusion of Exercise Phoenix in May 2006 adds confidence to the belief that the Great Britain ESI is capable of conducting a successful Black Start recovery from Total Shutdown. Present capability has been reinforced by the close attention paid to the Black Start process by participating companies, in consequence of both the Review and the Exercise parts of the Programme.

A full report on Exercise Phoenix has been produced as a companion document to this Review report.

Further work needed

At the tactical level: Many opportunities were identified during Exercise Phoenix for improvements at a tactical level: these measures have been, or will be, adopted by participating companies according to local circumstances.

At the strategic level:

- 1 **Governance:** the development and introduction of a more robust approach to the governance of the Black Start process.
- 2 **Telecommunications:** Development of an objective understanding of the resilience of national telecommunication systems in conditions of electricity Total Shutdown, leading to the specification of standards of performance appropriate to national need.
- 3 **Gas supply:** Analysis of the inter-dependence of public electricity supply and national gas production, import, terminal site operation, treatment, delivery and storage arrangements.

- 4 **Investment:** Identification and specification of selective improvements in SCADA and substation auxiliary systems.
- 5 **Consequence identification and management:** Delivery of comprehensive guidance on electricity supply arrangements to enable other key public service providers (including HMG Departments) to better understand the measures they should adopt as a part of their business continuity planning processes, and to support their compliance with the provisions of the Civil Contingencies Act 2004.



Table of Recommendations and actions

#	Recommendation	Commentary	LEAD, report to ...	Target Delivery Date
1 Governance				
1.1	Introduce comprehensive prescriptive arrangements for pan-industry process review, documentation, training & practice	Grid Code Review Panel to develop revisions giving sufficient scope to the System Operator to superintend the capability of Black Start participant companies.	NGET Report to E3	08/2007
1.2	E3 to encourage participant companies to include Black Start capability in corporate risk reporting process.	Evidence of Black Start capability is a matter of national importance.	E3 Report to SoS	10/2006
2 Telecommunications				
2.1	Establish objective measurement of the resilience of public and private telecommunications systems used by the GB electricity and gas companies, spanning off-shore gas production to gas and electricity delivery to customers.	This work has already commenced via the E3C Electricity Task Group. It is particularly important that this work receives sustained support by DTI and co-ordinates with the requirements of the Cabinet Office.	DTI Energy Group Report to E3	10/2006
2.2	Bring forward recommendations on improvement, replacement, or alternative systems providing resilience fit for purpose.	This work should include a review of the status of key telecommunications, gas & electricity operational sites, and the specification of the telecommunication facilities between key sites.	DTI Energy Group Report to E3	01/2007
3 Gas				
3.1	Undertake analysis of the inter-dependence between electricity System Operator and gas transmission control arrangements, and of electricity supply and national gas production, import, terminal site operation, treatment, delivery, and storage arrangements.	This work is partially underway within the National Grid Company, the E3C Gas Task Group, and DTI, but without sufficient co-ordination. It might be found that analysis capability is beyond the capacity of individual businesses, and external skills may have to be procured.	DTI Energy Group Report to E3	12/2006
3.2	In anticipation of results from 3.1, develop a policy on gas terminal resilience in the context of multiple site	In the national interest, and in the context of concurrent electricity supply failure to multiple terminal sites.	DTI Energy Group	03/2007

#	Recommendation	Commentary	LEAD, report to ...	Target Delivery Date
	electricity supply failure.		Reports to E3	
4 Investment				
4.1	Develop specifications for minimum standards of transmission system control centre and substation auxiliary resilience.	To include proposals for a programme of remedial work, with evidence of projected expenditure incurred to complete.	NGET Reports to E3	03/2007
4.2	Develop specifications for minimum standards of distribution network control centre and substation auxiliary resilience.	Ditto	ENA OSG Reports to E3	03/2007
5 Consequence identification & management				
5.1	Develop and activate a programme of delivery of comprehensive guidance on electricity supply arrangements to key public service agencies (inc. HMG Departments)	To enable better grasp of the measures to be adopted as a part of the business continuity planning process, and to support compliance with the provisions of the Civil Contingencies Act 2004.	E3C ETG & CTG Reports to E3C & E3	08/2006