






Workgroup Consultation		At what stage is this document in the process?
<h1>GC0125 </h1> <p>Mod Title: EU Code Emergency & Restoration: Black Start testing requirements for Interconnectors, HVDC System Owners and Owners of Transmission DC Converters</p>		<div>01 Proposal form</div> <div>02 Workgroup Consultation</div> <div>03 Workgroup Report</div> <div>04 Code Administrator Consultation</div> <div>05 Draft Grid Code Modification Report</div> <div>06 Final Grid Code Modification Report</div>
<p>Purpose of Modification: This modification seeks to align the GB Grid Code with the European Emergency and Restoration Code, specifically in relation to Black Start testing for Interconnectors.</p>		
	<p>This document contains the discussion of the Workgroup which formed in May 2019 to develop and assess the proposal. Any interested party is able to make a response in line with the guidance set out in the Governance Rules of the Grid Code.</p> <p>Published on: 21 June 2019</p> <p>Length of Consultation: 15 Working days</p> <p>Responses by: 12 July 2019</p>	
	<p>High Impact: Electricity System Operator (ESO), external Transmission System Operators (TSOs), Interconnectors wishing to provide Black Start.</p>	
	<p>Medium Impact: None.</p>	
	<p>Low Impact: None.</p>	

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Timetable		 Any questions? Contact: Chrissie Brown Code Administrator  Christine.brown1@ntionalgrideso.Com  07866794568 Proposer: Antony Johnson  antony.johnson@nationalgrideso.com  01926 655466
The Code Administrator recommends the following expedited timetable:		
Initial consideration by Workgroup	May 2019	
Workgroup Consultation	21 June 2019	
Modification concluded by Workgroup	August 2019	
Workgroup Report presented to Panel	29 August 2019	
Code Administration Consultation Report issued to the Industry	August 2019	
Draft Final Modification Report presented to Panel	September 2019	
Modification Panel recommendation	September 2019	
Final Modification Report issued the Authority	October 2019	
Authority decision (25WDs)	November 2019	
Decision implemented into the Grid Code	By 18 December 2019	

1 About this document

This Workgroup Consultation contains the discussion of the Workgroup which formed in May 2019 to develop and assess the proposal.

Section 2 (Original Proposal) and **Section 3 (Proposer's solution)** are sourced directly from the Proposer and any statements or assertions have not been altered or substantiated/supported or refuted by the Workgroup. Section 5 of the Workgroup contains the discussion by the Workgroup on the Proposal and the potential solution.

The Grid Code Panel detailed in the Terms of Reference the scope of work for the GC0125 Workgroup and the specific areas that the Workgroup should consider.

The table below details these specific areas and where the Workgroup have covered them or will cover them post Workgroup Consultation.

The full Terms of Reference can be found in Annex 2.

Terms of Reference

Specific Area	Location in the report
Implementation and costs;	Page 11.
Review draft legal text should it have been provided. If legal text is not submitted within the Grid Code Modification Proposal the Workgroup should be instructed to assist in the developing of the legal text;	Annex 4 and Workgroup discussions section 5.
Consider whether any further Industry experts or stakeholders should be invited to participate within the Workgroup to ensure that all potentially affected stakeholders have the opportunity to be represented in the Workgroup. Demonstrate what has been done to cover this clearly in the report;	Following the first workgroup, members and the Code Administrator sought to source further membership. Further Interconnector members joined following this.
Introduce Black start testing requirements as a result of E&R;	Workgroup discussions section 5.
To introduce interconnectors as a source of Black start;	Workgroup discussions section 5.
Review all current Black start references for suitability; and	Workgroup discussions section 5.

Ensure all Black start providers are treated equally as far as practical in the scope of E&R	Workgroup discussions section 5.
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Acronym Table

Acronym	Meaning
E&R NC	Emergency and Restoration Network Code ¹
HVDC	High Voltage Direct Current
NGESO	National Grid Electricity System Operator

2 Original Proposal

Section 2 (Original Proposal) and Section 3 (Proposer's solution) are sourced directly from the Proposer and any statements or assertions have not been altered or substantiated/supported or refuted by the Workgroup. Section 5 of the Workgroup Consultation contains the discussion by the Workgroup on the Proposal and the potential solution.

Defect

The Grid Code doesn't currently include black start testing requirements for interconnectors and HVDC Systems nor does it have provisions to allow HVDC System to provide such services, whereas the [Emergency and Restoration Network Code \(E&R NC\)](#) does. Therefore, the Grid Code needs to be aligned to the European Network Code to reflect these requirements.

What

The Grid Code currently has testing requirements for generators choosing to provide a black start service, which were aligned to E&R as a result of GC0108. This was approved by Ofgem on 21st November 2018. E&R also sets out testing requirements for interconnectors and HVDC Systems offering Black Start but these are not currently specified in the Grid Code. This modification seeks to add these requirements to facilitate alignment with E&R.

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2196&from=EN>

Why

The requirements need to be added to the Grid Code to reflect the testing requirements that will be necessary as of 18th December 2019.

How

This modification proposes to align the testing requirements set out in the E&R with GB frameworks by adding the requirements in OC.5.7 of the Operating Code within the Grid Code. The current Grid Code is written with respect to the provision of Black Start Services from Generators only. This modification is required to introduce Black Start Services from HVDC Systems. The Workgroup discussed the likely impact of other parties providing Black Start Services in the future which could be made up from other technologies. The opportunity has therefore been taken to introduce the term of a Black Start Service Provider which will address the defect and also provide future proofing to other Black Start technologies in the future.

It will be specified that High Voltage Direct Current systems delivering a black start service will be required to execute a black start capability test at least every three years and will detail how this needs to be done.

Governance

Justification for Normal Procedure to apply

Normal Governance procedures should apply as there will be a material impact on interconnectors who wish to deliver a black start service in future.

There is no need for this modification to be treated as urgent as the requirements do not need to be in the Grid Code before 18th December 2019.

Requested Next Steps

This modification should:

- be assessed by a Workgroup

Following the feedback received for modification **GC0108 EU Code: Emergency & Restoration: Black Start Testing requirement** and given that this modification is slightly more complex given that the requirements are new and do not currently exist in the Grid Code, we believe a workgroup should help to develop the final solution.

The Grid Code Review Panel decided that this modification should follow the standard route by forming a Workgroup and the modification being submitted to the Authority for decision.

Why Change?

This Proposal is one of a number of Proposals which seek to implement relevant provisions of a number of new EU Network Codes/Guidelines which have been introduced in order to enable progress towards a competitive and efficient internal market in electricity. Some EU Network Guidelines are still in development and these may in due course require a review of the solutions developed for the Codes that come into force beforehand. The full set of EU network guidelines are:

- Regulation 2015/1222- Capacity Allocation and Congestion Management (CACM) which came into force 14 August 2015
- Regulation 2016/1719 – Forward Capacity Allocation (FCA) which came into force 17 October 2016
- Regulation 2016/631- Requirements for Generators (RfG) which came into force 17 May 2016
- Regulation 2016/1388 – Demand Connection Code (DCC) which came into force 7 September 2016
- Regulation 2016/1447 – High Voltage Direct Current (HVDC) which came into force 28 September 2016
- Transmission System Operation Guideline (SOGL) - which came into force 14 September 2017
- Regulation 2017/2196 - Emergency and Restoration (E&R) which came into force 18 December 2018.

The Regulation establishing an E&R came into force on 18 December 2017. The E&R sets out rules relating to the management of the electricity transmission system in the emergency, blackout and restoration states. The main objective of the relevant rules is to bring the system back to the normal state as quickly and efficiently as possible.

Code Specific Matters

Technical Skillsets

Understanding of black start arrangements

Reference Documents

Emergency and Restoration Code:

<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2196&from=EN>

GC0108 Report:

<https://www.nationalgrideso.com/codes/grid-code/modifications/gc0108-eu-code-emergency-restoration-black-start-testing-requirement>

Emergency and Restoration consultation documents (including the System Restoration Plan):

<https://www.nationalgrideso.com/codes/european-network-codes/meetings/emergency-and-restoration-consultation>

3 Proposers Solution

Section 2 (Original Proposal) and Section 3 (Proposer's solution) are sourced directly from the Proposer and any statements or assertions have not been altered or substantiated/supported or refuted by the Workgroup. Section 5 of the Workgroup Consultation contains the discussion by the Workgroup on the Proposal and the potential solution.

E&R Article 46:

Each restoration service provider which is an HVDC system delivering a black start service shall execute a black start capability test, at least every three years.

HVDC Article 71(11):

With regard to the black start test, if applicable:

(a) the HVDC system shall demonstrate its technical capability to energise the busbar of the remote AC substation to which it is connected, within a time frame specified by the relevant TSO, according to Article 37(2);

(b) the test shall be carried out while the HVDC system starts from shut down;

(c) the test shall be deemed passed, provided that the following conditions are cumulatively fulfilled:

(i) the HVDC system has demonstrated being able to energise the busbar of the remote AC-substation to which it is connected;

(ii) the HVDC system operates from a stable operating point at agreed capacity, according to the procedure of Article 37(3).

Both the requirements from E&R and the methodology described in HVDC will need to be incorporated into the Grid Code.

4 Impacts & Other Considerations

Interconnectors, HVDC System Owners and owners of Transmission DC Converters wishing to deliver a black start service to NGESO will be affected by GC0125 as this will define how they must demonstrate compliance for this service and how often these tests will need to be completed. It should be noted that black start is not a mandatory service and so interconnectors, HVDC System Owners and owners of Transmission DC Converters not wishing to offer this service will not be affected by GC0125.

NGESO need to assess the implications of the Emergency and Restoration Network Code (E&R NC) in terms this Grid Code modification (GC0125) and the wider Black Start testing arrangements.

The E&R NC applies to new and existing Owners of HVDC Systems. The three Connection Network Codes, (RfG, HVDC and DCC) apply only for new² plant, and as such when these codes were implemented into the (GB) Grid Code, the specific requirements for *HVDC Systems* were defined in the European Connection Conditions of the Grid Code. In the case of existing HVDC plant owners who are termed *DC Converter Station Owners*, this picks up the technical requirements in the Connection Conditions of the Grid Code rather than the European Connection Conditions. Since the E&R NC applies to both new and existing *HVDC Owners*, then the proposed legal drafting for GC0125 has been updated to refer to both *HVDC Systems* and *DC Converter Stations*. In addition, reference has also been made to *Transmission DC*

² Or, in a limited set of circumstances, to an existing plant where that plant substantially modifies – see Article 4 of the relevant Connection Network Code for further details.

Converters which are new or existing HVDC installations which form part of an *Offshore Transmission System*.

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

No.

Consumer Impacts

This change will facilitate the implementation of the EU Emergency & Restoration Network Code which helps to facilitate a harmonised electricity system as part of the package of European Network Codes, and will help to deliver and facilitate a significant benefit to the end consumer by ensuring a coordinated security of supply across GB and Europe.

5 Workgroup discussions

The Workgroup convened on two occasions between May 2019 and June 2019 to discuss the perceived issue, detail the scope of the proposed defect, devise potential solutions and assess the proposal in terms of the Grid Code Objectives. The Workgroup will in due course conclude these tasks after this consultation (taking account of responses to this consultation).

The Workgroup discussed a number of the key attributes under GC0125 and these discussions are described below.

Testing frequency, synchronisation and consistency

The Proposer of GC0125 explained to the Workgroup that this modification has been raised to ensure that the requirements outlined in the E&R NC for HVDC systems are implemented into the Grid Code. They outlined that there were two potential ways forward with regards to the legal text. This would either be (a) to create a new section for Interconnectors, HVDC systems and Transmission DC Converters or (b) to integrate the requirements in line with the current Generator Grid Code requirements.

The Workgroup discussed this. A Workgroup member from an interconnector party stated that ideally, they would like there to be a separate section whilst another Workgroup member stated that it would be of benefit to go through each clause of the legal text for Generators and assess whether it should be applicable for HVDC systems and added that this was part of the agreed Terms of Reference. This would then ensure consistency in drafting of the legal text. A Workgroup member also noted that treating Generators and HVDC systems in the same way; in terms of the provision of Black Start in GB; would avoid discrimination in treatment between Restoration Service Providers³ (as this was not permitted according to E&R NC) as well as ensuring the most robust approach for the restoration of the whole system. The Workgroup agreed that this would be the best way to proceed. The Proposer stated that they wanted to ensure the legal text is as simple and easy to digest as possible whilst ensuring that the requirements are consistent between all Black Start providers where possible when considering the requirements as part of the E&R NC.

The Workgroup went onto discuss whether the compliance testing was to also include synchronisation and not just the energisation of the busbar. An example used by the Proposer when explaining Black Start testing was that if you had a car and needed to know whether it would be able to run in certain circumstances you wouldn't simply ensure it started, you would also test whether it could run by attempting to complete a reasonable journey. This means fully testing the Black Start capability of the plant which, as other Workgroup members noted, was what all other Black Start providers in GB had to do (as currently codified in the Grid Code).

The Workgroup noted that there were some definitions that would not be relevant for HVDC such as 'shutdown'. The Proposer took an action to review and amend these definitions which became part of the second iteration of the proposed legal text.

³ Defined in Article 3(2) of E&R NC as “‘restoration service provider’ means a legal entity with a legal or contractual obligation to provide a service contributing to one or several measures of the restoration plan”.

A Workgroup member asked how often the compliance tests for HVDC systems would be carried out. The Proposer took an action to look into and clarify whether the tests would be required to be carried out every three years or longer (such as eight years). A Workgroup member stated that if this is every three years that this would in their view be difficult for NGESO to complete. A Workgroup member stated that they thought that the testing of the energisation of the busbar would be every three years and the full test conducted every eight years (which included synchronisation) as part of the Local Joint Restoration Plan. However, another Workgroup member noted that if there was to be such an approach to the timing of compliance testing for Black Start providers, it would have to be over the same timeframes for all Black Start providers (HVDC Systems and Generators) in order to avoid discrimination as well as to ensure robust testing of the whole Black Start capability (in the form of Local Joint Restoration Plans).

Black Start Standard – 1 April 2020

The Workgroup noted that it is currently being proposed by BEIS and Ofgem that there will be a new Black Start Standard (applicable to a number of stakeholders) which could possibly be in place from 1 April 2020. The Workgroup discussed the fact that this may mean further amendments to the requirements on interconnectors, HVDC System Owners and Transmission DC Converter Station Owners in the future and that it was important that they were aware that these may change following the implementation of this modification (should it be approved by the Authority). The Workgroup decided that the best course of action was to note this given the fact that the draft of the proposed Black Start Standard document is not currently in the public domain for them to discuss. It was recognised that Interconnector parties, HVDC System Owners and Transmission DC Converter Station Owners had not been involved in these discussions and a Workgroup member from an Interconnector owner has now contacted relevant people within NGESO to ascertain how such parties can get involved.

Black Start Procurement Methodology and Strategy

A Workgroup member noted that if there was an inconsistency between the E&R NC requirements and the GB Black Start procurement methodology and strategy, then the Black Start procurement methodology and strategy will need to be amended to comply with EU law; i.e. E&R NC.

Notice ahead of testing

Under the current Grid Code (OC5.7.1(e)), NGESO is only required to provide seven days' notice to Black Start Providers for carrying out Black Start testing. A Workgroup member enquired as to whether this is what happens in practice or whether it is just for emergency situations and would ideally prefer a longer notice period. During the first Workgroup meeting the Proposer took an action to look into this and clarify.

The Proposer confirmed that the obligation to undertake Black Start tests should be undertaken in a reasonable, efficient and proportionate way is required by the E&R NC. The Proposer outlined that a three-year assurance plan is provided to the Authority and that from 2020 Black Start testing will be integrated into the year ahead Transmission Planning process. The Proposer went on to confirm that a significant amount of preparatory work is generally required in order to prepare for a Black Start test which

will require early engagement with the Black Start Provider. This would generally require engagement and discussion approximately three months ahead of the testing date. It was noted that as part of the preparatory work the testing dates would be discussed as part of this phase with the formal paperwork being issued seven working days before the actual test date once all of the information has been collected (test plan, transmission and commercial knowledge etc.). The Workgroup went on to discuss whether the most reasonable, efficient and proportionate time for holding such a test would be during planned outages. It was noted that this could be the most efficient time but also that there was an increased risk of uncertainty due to the risk of planned outages overrunning and the complexity of having such an outage running at the same time as a Black Start test, with each item having its own associated uncertainties. It was also concluded that this would be different on a case to case basis. The Proposer explained that the seven day advance notice period for each test was as defined in the Legal text and would not be amended; but this was on the premise that extensive pre-work would be required prior to the formal notification of the test.

Cross modification considerations

It was noted by the Workgroup that there were two Articles in the Emergency & Restoration Network Code that could lead to further amendments to the requirements on HVDC Systems (in addition to other Black Start Providers). These were the following;

Article 43 (2)

By 18 December 2019 each TSO shall define a test plan in consultation with the DSOs, the SGUs identified pursuant to Articles 11(4) and 23(4), the defence service providers and the restoration service providers. The test plan shall identify the equipment and capabilities relevant for the system defence plan and the restoration plan that have to be tested.

Article 51

Compliance testing and periodic review of the restoration plan

1. Each TSO shall review the measures of its restoration plan using computer simulation tests, using data from the DSOs identified pursuant to Article 23(4) and the restoration service providers, at least every five years. The TSO shall define these simulation tests in a dedicated testing procedure covering at least:

(a) the energising restoration path from restoration service providers with black start or island operation capabilities;

(b) the supply of power generating modules main auxiliaries;

(c) the demand reconnection process; and

(d) the process for resynchronisation of networks in island operation. L 312/82 EN Official Journal of the European Union 28.11.2017 2.

2. In addition, where deemed necessary by the TSO for the effectiveness of the restoration plan, each TSO shall execute operational testing of parts of the restoration plan, in coordination with the DSOs identified pursuant to Article 23(4) and the

restoration service providers. The TSO shall set out, in consultation with the DSOs and restoration service providers, those operational tests in a dedicated testing procedure.

3. Each TSO shall review its restoration plan to assess its effectiveness, at least every five years.

4. Each TSO shall review the relevant measures of its restoration plan in accordance with paragraph 1 and review their effectiveness before any substantial change in the configuration of the grid.

5. When the TSO identifies the need to adapt the restoration plan, it shall amend its restoration plan and implement these amendments in accordance with points (c) and (d) of Article 4(2) and Articles 23 and 24.

As part of the Workgroup discussions, it was noted that Articles 43(2) and 51 (as replicated above) appear to apply to all Black Start Providers (not just HVDC Systems) and it was queried if these Articles should be included within the scope of GC0125. The Proposer took an action to clarify whether these two Articles would be addressed as part of this GC0125 modification or in the System Defence Plan and System Restoration Plan related Grid Code Modifications GC0127⁴ and GC0128⁵ respectively which, like GC0125, was proposed by NGESO. It was noted that should it be covered in this GC0125 modification, then there are a number of stakeholders who could be impacted who are not currently Workgroup members. The Proposer's view is that these Articles would be better addressed as part of other Grid Code Modifications (GC0127 and GC0128). It was also noted by the Workgroup that Interconnectors, HVDC System Owners and Transmission DC Converter Owners should be aware that these two Articles from the E&R NC will be addressed in terms of the GB Grid Code definitions. Following the initial Workgroup meeting, the Proposer confirmed that Article 43 and 51 as outlined above would be covered under GC0127 and GC0128.

The Workgroup agreed that they would be mindful of any other related modifications that were ongoing to ensure no overlap in legal text requirements and duplication of work.

Definition of Black Start Contract

As part of the Workgroup discussion, one Workgroup member suggested that the Grid Code proposed definition of '*Black Start Contract*' should be updated to reflect the E&R NC Article 4 (2) (b), which requires the terms and conditions that will be applicable to restoration service providers to be approved by the NRA (after being proposed by the TSO). In GB, the TSO is NGESO and the NRA is Ofgem. Therefore, the Workgroup

⁴ <https://www.nationalgrideso.com/codes/grid-code/modifications/gc0127-eu-code-emergency-restoration-requirements-resulting-system>

⁵ <https://www.nationalgrideso.com/codes/grid-code/modifications/gc0128-eu-code-emergency-restoration-requirements-resulting-system>

member suggested additional wording (shown as the red text below) to reflect the legal position.

Black Start Contract	An agreement; between a Generator or an HVDC System Owner and The Company under which the Generator or an HVDC System Owner or a DC Converter Station Owner provides Black Start Capability and other associated services; in accordance with the terms and conditions to act as restoration service provider on a contractual basis approved by the Authority in accordance with Article 4 (2) (b) and (4).or as amended in accordance with Article 4(7), of Regulation (EU) 2017/2196.
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The Proposer currently assessed this additional text internally with its Contracts and Legal team and the view of the Proposer is that the additional text should be removed on the basis that it could lead to contractual terms and conditions needing to use the Grid Code process which does not retain the current contractual flexibility or tender approach which is currently adopted in GB. The Workgroup member noted that compliance with the European law (as set out in E&R NC) would take legal precedence over any current national regulatory requirements. As a result, the current GB ‘contractual flexibility’ approach may not be compatible, going forward, with the harmonisation and standardised approach to contracting for restoration service providers required by E&R NC. In addition, Grid Code consultations GC0125, GC0127 and GC0128 are subject to a detailed mapping process to ensure that the requirements of the E&R NC are mapped into the appropriate GB Documentation.

Other Definitions

As part of this GC0125 modification, a number of other definitions have also been included in the draft Legal text which also relate to the wider context of implementation of E&R NC which are expected to be required in Grid Code Consultations GC0127 and GC0128. These include the definitions of “*Defence Service Provider*”, “*Restoration Service Provider*”, “*System Defence Plan*” and “*System Restoration Plan*”.

For the definitions of *System Defence Provider* and *System Restoration Provider*, the Proposer initially suggested the definition included the terms *User* and *Demand Response Provider*. One Workgroup member was concerned that the proposed GC0125 definitions of *System Defence Provider* and *System Restoration Provider* appeared to be different to the same terms that are defined in the E&R NC and highlighted that if such an inconsistency prevailed it could give rise to legal confusion – although as EU law prevails, the E&R NC would prevail over any Grid Code definitions. The Proposer agreed to amend the draft legal text and this has been completed. As part of the discussions, one Workgroup member suggested the term *Demand Response Provider* may not be relevant. The Proposer has since re-evaluated these definitions and taken the decision to remove *Demand Response Provider* from the proposed definitions for GC0125.

Why are there differences between the requirements on HVDC systems when compared to that of Generators?

The Workgroup noted that in the draft legal text for GC0125 that there are some cases in the European Connection Conditions (for example ECC.6.3.5) where the proposed GC0125 requirements for Black Start were different between Generators and HVDC

Systems parties. The Proposer advised that this was correct as the requirements for Black Start as codified in EU Regulation 2016/631 Requirements for Generators is different to that in EU Regulation 2016/1447 HVDC, and that these differences had simply been mapped across to the GB Grid Code as part of the implementation of the European Connection Network Codes.

Future aspirations for our Codes

A Workgroup member noted that the ideal way forward would be to be technology neutral when drafting requirements for situations such as Black Start, suggesting NGESO would have a requirement which would be the same regardless of the technology providing it. The Workgroup noted that this is an ideal aspiration but would be out of scope of this GC0125 modification.

Block loading capability

To ensure consistency between Generation and HVDC Systems, the data required from Generators includes the requirements for *Block Load Capability*. This is effectively the incremental *Active Power* steps from no load to Rated MW which a Generator can instantaneously supply without causing it to trip or go outside the frequency range 47.5Hz – 52Hz.

This data is required for Generation as provided for under PC.A.5.7 of the Grid Code and reflected in the Schedule 16 of the Data Registration Code (DRC). To reflect consistent and equitable treatment between Generation and HVDC Systems, similar requirements have been added to HVDC Systems with amendments being made to PC.A.5.7 and DRC Schedule 16 in the proposed legal text for GC0125. In practice, HVDC Systems tend to have a continuous active power ramping capability rather than block load increments, however the GB Grid Code has been updated to ensure equitable treatment between HVDC Systems and generation.

Demand Response Providers in the early stages of Black Start

One Workgroup member noted that it could be unclear as to how a Demand Response Provider would be used within a Black Start situation. The Proposer has since re-evaluated the legal text and taken the view that it would be appropriate to remove the term “Demand Response Provider” from the definition of “Defence Service Provider” or “Restoration Service Provider” on the basis that they would not be obligated to satisfy the full requirements of the Grid Code and they are only required to satisfy those conditions of their Commercial Contract which may not necessarily extend to the measures of the E&R NC. However, another Workgroup member noted that if the Demand Response Provider was providing a restoration service (that is providing a service contributing to one or several measures of the System Restoration Plan) to NGESO then that would be covered by the requirements of the E&R NC. In general terms if a Demand Response Provider was considered to be a Restoration Service Provider it would be treated as a User under the Grid Code and therefore caught by the requirements of the Operation and Balancing Codes.

6 Relevant Objectives

Impact of the modification on the Applicable Grid Code Objectives:

Relevant Objective	Identified impact
(a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	Positive - To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity
(b) Facilitating effective competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);	Positive - Specifying these requirements will make it easier for interconnectors to offer black start as a service, thereby opening up the market to more participants and increasing competition.
(c) Subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole;	Positive - Encouraging more black start providers will allow for additional system security should a black start event ever occur.
(d) To efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency; and	Positive - Discharges the obligations of the Emergency and Restoration code into GB frameworks.
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	None

7 Implementation

NGESO is required to have implemented the System Restoration Plan⁶ by 18th December 2019; therefore this GC0125 modification needs to have been approved and implemented by this deadline.

8 How to respond

The GC0125 Workgroup is seeking the views of Grid Code Parties and other interested parties in relation to the issues noted in this document and specifically in response to the questions highlighted in the report and summarised below:

Standard Workgroup Consultation questions:

- Q1:** Do you believe that GC0125 Original proposal better facilitates the Grid Code Objectives?
- Q2:** Do you support the proposed implementation approach?
- Q3:** Do you have any other comments?
- Q4:** Do you wish to raise a Workgroup Consultation Alternative request for the Workgroup to consider?

Specific GC0125 Workgroup Consultations Questions:

- Q5.** Do you believe the Black Start testing requirements set out in the draft legal text at OC5.7.1(a) – (e) accurately reflects the testing requirements and adequately distinguishes the obligations between Black Start Power Stations and Black Start HVDC Systems acknowledging that there are differences between them on the basis of their technology. Please provide your rationale bearing in mind a power station could be made up of a number of Black Start Generating Units whereas as Black Start HVDC System would apply to each HVDC System.

Please send your response using the response proforma which can be found on the National Grid website via the following link:

<https://www.nationalgrideso.com/codes/grid-code/modifications/gc0125-eu-code-emergency-restoration-black-start-testing-requirements>

In accordance with the Grid Code Governance Rules of, Any Authorised Electricity Operator; the Citizens Advice or the Citizens Advice Scotland, The Company or a Materially Affected Party may also raise a Workgroup Consultation Alternative Request. If you wish to raise such a request, please use the relevant form available at the weblink below:

⁶ And the System Defence Plan, which is not part of this GC0125 proposal (as it is addressed via a separate Grid Code proposal, GC0127).

http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/amendments/forms_guidance/

Views are invited upon the proposals outlined in this report, which should be received by **5pm on 12 July 2019**.

Your formal responses may be emailed to: grid.code@nationalgrideso.com

If you wish to submit a confidential response, please note that information provided in response to this consultation will be published on National Grid's website unless the response is clearly marked "Private & Confidential", we will contact you to establish the extent of the confidentiality. A response marked "Private & Confidential" will be disclosed to the Authority in full but, unless agreed otherwise, will not be shared with the Grid Code Review Panel or the industry and may therefore not influence the debate to the same extent as a non-confidential response.

Please note an automatic confidentiality disclaimer generated by your IT System will not in itself, mean that your response is treated as if it had been marked "Private and Confidential"

Annex 1 – extracts from European Network Codes

Emergency & Restoration Code

Article 46

Compliance testing of HVDC capabilities

Each restoration service provider which is an HVDC system delivering a black start service shall execute a black start capability test, at least every three years, following the methodology laid down in Article 70(11) of Regulation (EU) 2016/1447.

HVDC

Article 71

Compliance testing for HVDC systems

11. With regard to the black start test, if applicable:

- (a) the HVDC system shall demonstrate its technical capability to energise the busbar of the remote AC substation to which it is connected, within a time frame specified by the relevant TSO, according to Article 37(2);
- (b) the test shall be carried out while the HVDC system starts from shut down;
- (c) the test shall be deemed passed, provided that the following conditions are cumulatively fulfilled:
 - (i) the HVDC system has demonstrated being able to energise the busbar of the

- remote AC-substation to which it is connected;
- (ii) the HVDC system operates from a stable operating point at agreed capacity, according to the procedure of Article 37(3).

Article 37

Black start

1. The relevant TSO may obtain a quote for black start capability from an HVDC system owner.
2. An HVDC system with black start capability shall be able, in case one converter station is energised, to energise the busbar of the AC-substation to which another converter station is connected, within a timeframe after shut down of the HVDC system determined by the relevant TSOs. The HVDC system shall be able to synchronise within the frequency limits set out in Article 11 and within the voltage limits specified by the relevant TSO or as provided for in Article 18, where applicable. Wider frequency and voltage ranges can be specified by the relevant TSO where needed in order to restore system security.
3. The relevant TSO and the HVDC system owner shall agree on the capacity and availability of the black start capability and the operational procedure.

Annex 2 – Terms of Reference

Workgroup Terms of Reference and Membership

TERMS OF REFERENCE FOR GC0125 WORKGROUP

GC0125 – EU Code Emergency & Restoration: Black Start testing requirements for Interconnectors

Responsibilities

1. The Workgroup is responsible for assisting the Grid Code Review Panel in the evaluation of Grid Code Modification Proposal **GC0125: 'EU Code Emergency & Restoration: Black Start testing requirements for Interconnectors'** proposed by Rachel Woodbridge Stocks of National Grid Electricity System Operator in March 2019 and presented to the Grid Code Review Panel on 28 March 2019.
2. The proposal must be evaluated to consider whether it better facilitates achievement of the Grid Code Objectives. These can be summarised as follows:
 - (i) *To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;*
 - (ii) *To facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);*
 - (iii) *Subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national; and*
 - (iv) *To efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency. In conducting its business, the Workgroup will at all times endeavour to operate in a manner that is consistent with the Code Administration Code of Practice principles.*
 - (v) *To promote efficiency in the implementation and administration of the Grid Code arrangements.*

Scope

3. The Workgroup must consider the issues raised by the Modification Proposal and consider if the proposal identified better facilitates achievement of the Grid Code Objectives.
4. In addition to the overriding requirement of point 3 above, the Workgroup shall consider and report on the following specific issues:
 - a) *Implementation and costs;*

- b) Review draft legal text should it have been provided. If legal text is not submitted within the Grid Code Modification Proposal the Workgroup should be instructed to assist in the developing of the legal text;*
 - c) Consider whether any further Industry experts or stakeholders should be invited to participate within the Workgroup to ensure that all potentially affected stakeholders have the opportunity to be represented in the Workgroup. Demonstrate what has been done to cover this clearly in the report;*
 - d) Introduce Black start testing requirements as a result of E&R;*
 - e) To introduce interconnectors as a source of Black start;*
 - f) Review all current Black start references for suitability; and*
 - g) Ensure all Black start providers are treated equally as far as practical in the scope of E&R.*
5. As per Grid Code GR20.8 (a) and (b) the Workgroup should seek clarification and guidance from the Grid Code Review Panel when appropriate and required.
 6. The Workgroup is responsible for the formulation and evaluation of any Workgroup Alternative Grid Code Modifications arising from Group discussions which would, as compared with the Modification Proposal or the current version of the Grid Code, better facilitate achieving the Grid Code Objectives in relation to the issue or defect identified.
 7. The Workgroup should become conversant with the definition of Workgroup Alternative Grid Code Modification which appears in the Governance Rules of the Grid Code. The definition entitles the Group and/or an individual member of the Workgroup to put forward a Workgroup Alternative Code Modification proposal if the member(s) genuinely believes the alternative proposal compared with the Modification Proposal or the current version of the Grid Code better facilitates the Grid Code objectives The extent of the support for the Modification Proposal or any Workgroup Alternative Modification (WAGCM) proposal WAGCM arising from the Workgroup's discussions should be clearly described in the final Workgroup Report to the Grid Code Review Panel.
 8. Workgroup members should be mindful of efficiency and propose the fewest number of WAGCM proposals as possible. All new alternative proposals need to be proposed using the Alternative Request Proposal form ensuring a reliable source of information for the Workgroup, Panel, Industry participants and the Authority.
 9. All WAGCM proposals should include the Proposer(s)'s details within the final Workgroup report, for the avoidance of doubt this includes WACM proposals which are proposed by the entire Workgroup or subset of members.
 10. There is an option for the Workgroup to undertake a period of Consultation in accordance with Grid Code GR. 20.11, if defined within the timetable agreed by the Grid Code Panel. Should the Workgroup determine that they see the benefit in a Workgroup Consultation being issued they can recommend this to the Grid Code Review Panel to consider.

11. Following the Consultation period the Workgroup is required to consider all responses including any Workgroup Consultation Alternative Requests. In undertaking an assessment of any Workgroup Consultation Alternative Request, the Workgroup should consider whether it better facilitates the Grid Code Objectives than the current version of the Grid Code.
12. As appropriate, the Workgroup will be required to undertake any further analysis and update the appropriate sections of the original Modification Proposal and/or WAGCM proposals (Workgroup members cannot amend the original text submitted by the Proposer of the modification) All responses including any Workgroup Consultation Alternative Requests shall be included within the final report including a summary of the Workgroup's deliberations and conclusions. The report should make it clear where and why the Workgroup chairman has exercised their right under the Grid Code to progress a Workgroup Consultation Alternative Request or a WAGCM proposal against the majority views of Workgroup members. It should also be explicitly stated where, under these circumstances, the Workgroup chairman is employed by the same organisation who submitted the Workgroup Consultation Alternative Request.
13. The Workgroup is to submit its final report to the Modifications Panel Secretary on 22 July 2019 for circulation to Panel Members. The final report conclusions will be presented to the Grid Code Review Panel meeting on 30 July 2019.

Membership

It is recommended that the Workgroup has the following members:

Role	Name	Representing (User nominated)
Chair	Paul Mullen	National Grid Electricity System Operator, Code Administrator
Technical Secretary	Chrissie Brown	National Grid Electricity System Operator, Code Administrator
Proposer and Workgroup member*	Rachel Woodbridge-Stocks/Tony Johnson meeting two onwards	National Grid Electricity System Operator
Workgroup member*	Alastair Frew	Drax Generation Enterprise Ltd
Workgroup member*	Garth Graham	SSE Generation Limited
Workgroup member*	Nigel Wood	Nemolink Limited
Workgroup member*	Russell Smalley	Viking Link
Workgroup member*	Robert Selbie	Eleclink
Workgroup member*	Abdi Osman	IFA2

14. A (*) Workgroup must comprise at least 5 members (who may be Panel Members). The roles identified with an asterisk (*) in the table above contribute toward the required quorum, determined in accordance with paragraph 15 below.
15. The Grid Code Review Panel must agree a number that will be quorum for each Workgroup meeting. The agreed figure for GC0125 is that at least 5 Workgroup members must participate in a meeting for quorum to be met.
16. A vote is to take place by all eligible Workgroup members on the Modification Proposal and each WACM proposal and Workgroup Consultation Alternative Request based on their assessment of the Proposal(s) against the Grid Code objectives when compared against the current Grid Code baseline.

GC0125 Workgroup Terms of Reference

- Do you support the Original or any of the alternative Proposals?
- Which of the Proposals best facilitates the Grid Code Objectives?

The Workgroup chairman shall not have a vote, casting or otherwise. The results from the vote and the reasons for such voting shall be recorded in the Workgroup report in as much detail as practicable.

17. It is expected that Workgroup members would only abstain from voting under limited circumstances, for example where a member feels that a proposal has been insufficiently developed. Where a member has such concerns, they should raise these with the Workgroup chairman at the earliest possible opportunity and certainly before the Workgroup vote takes place. Where abstention occurs, the reason should be recorded in the Workgroup report.
18. Workgroup members or their appointed alternate are required to attend a minimum of 50% of the Workgroup meetings to be eligible to participate in the Workgroup vote.
19. The Technical Secretary shall keep an Attendance Record for the Workgroup meetings and circulate the Attendance Record with the Action Notes after each meeting. This will be attached to the final Workgroup report.
20. The Workgroup membership can be amended from time to time by the Grid Code Review Panel and the Chairman of the Workgroup.

Appendix 1 – Indicative Workgroup Timetable

Stage of the process	Date
Modification presented to Grid Code Review Panel	28 March 2019
Workgroup meeting 1	9 May 2019
Workgroup meeting 2	Late May 2019 TBC
Workgroup Consultation	June 2019
Workgroup meeting 3	Early July 2019 to discuss responses and finalise solution and any alternatives
Possible Workgroup meeting 4	Webex meeting to confirm Workgroup Report
Workgroup Report presented to GCRP	22 July 2019/30 July 2019
Code Administrator Consultation issued	30 July/20 August 2019
Draft Final Modification Report issued to Industry and Panel	21 August 2019
Grid Code Review Panel Recommendation Vote	29 August 2019
Final Modification Report submitted to the Authority	10 September 2019
Authority decision due (25WDs)	15 October 2019
Implementation in Grid Code	By 18 December 2019

Annex 3 – Attendance log

Key

A – Attended

X – Absent

O – Alternate

D – Dial-in

Name	Organisation	Role	09/05/2019 (informal meeting)	03/06/2019 (Meeting 1)	13/06/2019 (Meeting 2)
Paul Mullen	Code Administrator, NG Electricity System Operator	Chair	A	A	A
Chrissie Brown	Code Administrator, NG Electricity System Operator	Technical Secretary	A	A	A
Antony Johnson/Rachel Wood-bridge Stocks	National Grid Electricity System Operator	Proposer/Workgroup member	A	A	A
Mark Jones	National Grid Electricity System Operator	Subject matter expert	X	A	X
Alastair Frew	Drax Generation Enterprise Ltd	Workgroup member	D	D	D
Garth Graham	SSE Generation Limited	Workgroup member	D	D part meeting	D
Andy Colley	SSE Generation Limited	Alternate Workgroup member	X	D part meeting	D part meeting
Russell Smalley	Viking Link	Workgroup member	A	A	A

Nigel Wood	Nemolink Limited	Workgroup member	X	D	D
Abdi Osman	NG Ventures (IFA2)	Workgroup member	X	A	A
Rob Selbie	Eleclink	Workgroup member	X	D	D

Annex 4 – Draft legal text

This legal text has been reviewed by Workgroup members but is still in a draft format, should you have any comments on this please feed them in on your consultation response proforma.

GLOSSARY & DEFINITIONS

(GD)

GD.1 In the Grid Code the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the following meanings:

Black Start	The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown .
Black Start Capability	<u>In the case of Either a An ability in respect of a Black Start Station, is the ability</u> for at least one of its Gensets to Start-Up from Shutdown and to energise a part of the System and be Synchronised to the System upon instruction from The Company , within two hours, without an external electrical power supply. <u>In the case of a Black Start HVDC System is the ability of an to HVDC System to Start-Up from Shutdown and to energise a part of the System and- be Synchronised to the System upon instruction from The Company, within two hours, without an external electrical power supply from the GB Synchronous Area.</u>
Black Start Contract	An agreement between a <u>Black Start Service Provider Generator or an HVDC System Owner</u> and The Company under which the <u>Black Start Service Provider Generator or an HVDC System Owner</u> provides a Black Start Capability and other associated services; <u>in accordance with the terms and conditions to act as Restoration Service Providers on a contractual basis approved by the Authority in accordance with Article 4 (2) (b) and (4), or as amended in accordance with Article 4(7), of European Regulation (EU) 2017/2196.</u>
Block Loading Capability	The incremental Active Power steps, from no load to Rated MW , which a <u>Generator or HVDC System or DC Converter Station</u> can instantaneously supply without causing it to trip or go outside the Frequency range of 47.5Hz – 52Hz <u>(or an otherwise agreed Frequency range of 47.5 – 52Hz (or an otherwise agreed Frequency range))</u> . The time between each incremental step shall also be provided.
<u>Defence Service Provider</u>	<u>A User with a legal or contractual obligation to provide a service contributing to one or several measures of the System Defence Plan.</u>
<u>European Regulation (EU) 2017/2196</u>	<u>Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on emergency and restoration</u>
<u>Restoration Service Provider</u>	<u>A Black Start Service Provider or User with a legal or contractual obligation to provide a service contributing to one or several measures of the System Restoration Plan.</u>
<u>Black Start HVDC System</u>	<u>An HVDC System or DC Converter Station or Transmission DC Converter which are registered, pursuant to the Bilateral Agreement with a User, as having a Black Start Capability.</u>
<u>Black Start HVDC Test</u>	<u>A Black Start Test carried out by an HVDC System Owner or DC Converter Station Owner with a Black Start HVDC System while the Black Start HVDC System is disconnected from all external electrical power supplies from the GB Synchronous Area.</u>
<u>Black Start Service Provider</u>	<u>A Generator with a Black Start Station or an HVDC System Owner or DC Converter Station Owner with a Black Start HVDC System.</u>

Black Start Stations	Power Stations which are registered, pursuant to the Bilateral Agreement with a User , as having a Black Start Capability .
Black Start Test	A Black Start Test carried out by a Black Start Service Provider Generator with a Black Start Station , on the instructions of The Company , in order to demonstrate that a Black Start Station <u>or a Black Start HVDC System</u> has a Black Start Capability . <u>For the avoidance of doubt, a Black Start Test could comprise It can be a Black Start Station Test, or a Black Start Unit Test or Black Start HVDC Test.</u>
<u>Black Start</u> Station Test	A Black Start Test carried out by a Generator with a Black Start Station while the Black Start Station is disconnected from all external <u>electrical power supplies from the GB Synchronous Area</u> alternating current electrical supplies.
<u>Black Start</u> Unit Test	A Black Start Test carried out on a Generating Unit or a CCGT Unit or a Power Generating Module , as the case may be, at a Black Start Station while the Black Start Station remains connected to an external alternating current electrical supply.
Local Joint Restoration Plan	<p>A plan produced under OC9.4.7.12 detailing the agreed method and procedure by which a Black Start Service Provider Genset at a Black Start Station (possibly with other Gensets at that Black Start Station) or Black Start HVDC System will energise part of the Total System and meet complementary blocks of local Demand so as to form a Power Island.</p> <p>In Scotland, the plan may also: cover more than one Black Start-Station Service Provider; includ<u>ing</u> ge Gensets other than those at a Black Start Station and cover the creation of one or more Power Islands.</p>
Partial Shutdown	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 and, 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 The Company's directions relating to a Black Start .
Shutdown	<p><u>In the case of a Generating Unit is</u> the condition of a Generating Unit where the generator rotor is at rest or on barring.</p> <p><u>In the case of an HVDC System or DC Converter Station or Transmission DC Converter, is the condition of an HVDC System or DC Converter Station or Transmission DC Converter where the HVDC System or DC Converter Station or Transmission DC Converter is de-energised and therefore not importing or exporting Apparent Power to or from the Total System.</u></p>
Start-Up	<p><u>In the case of a Generating Unit is</u> the action of brining a Generating Unit from Shutdown to Synchronous Speed.</p> <p><u>In the case of an HVDC System or DC Converter Station or Transmission DC Converter, is the action of bringing the HVDC System or DC Converter Station from Shutdown to a state where it is energised.</u></p>
<u>System Defence Plan</u>	A document prepared by The Company , as published on its Website , outlining how the requirements of the "defence plan" (as provided for <u>European Regulation (EU) 2017/2196</u>) has been implemented within the GB Synchronous Area .
<u>System Restoration Plan</u>	A document prepared by The Company , as published on its Website , outlining how the requirements of the "restoration plan" (as defined in <u>European Regulation (EU) 2017/2196</u>) has been implemented within the GB Synchronous Area .

Total Shutdown	The situation existing when all generation has ceased and there is no electricity supply from External Interconnections and, therefore, the Total System has shutdown with the result that it is not possible for the Total System to begin to function again without The Company's directions relating to a Black Start .
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Extract from PC

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 **The Company** during a **Black Start** and should be provided by **Generators, HVDC System Owners and DC Converter Station Owners** where reasonably possible. For the avoidance of doubt, 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, HVDC System Owner and DC Converter Station Owner** to **The Company**. In the case of Generators, the data supplied should be with respect to each BM Unit at a Large Power Station (excluding the Generating Units (including Synchronous Generating Units within a Synchronous Power Generating Module) that are contracted to provide Black Start Capability, Power Park Modules (including DC Connected Power Park Modules) or Generating Units with an Intermittent Power Source). For the avoidance of doubt, the data required under PC.A.5.7 (a) and (b) below, does i) not need to be supplied in respect of Generators that are contracted to provide a Black Start Capability and ii), the data only needs to be supplied in respect of the BM Unit at a Large Power Station and does not need to include Generating Unit data;

(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 or HVDC System's or DC Converter 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 a Generating Unit (which is considered as both of a 'hot' unit and cold unit) that was **Synchronised** just prior to the **Total Shutdown or Partial Shutdown** and also for the condition of a 'cold' unit. In the case of an HVDC System or DC Converter Station, data should be provided when the HVDC System or DC Converter Station has been considered to have run immediately before the Total Shutdown or Partial Shutdown and equally when the HVDC System or DC Converter Station has been considered to have been Shutdown for a period of 48 hours or more. The block loading assessment should be done against a frequency variation of 49.5Hz – 50.5Hz.

Extract from CC

CC.6.3.5 It is an essential requirement that the **National Electricity Transmission System** must incorporate a **Black Start Capability**. This will be achieved by agreeing a **Black Start Capability** at with a number of strategically located **Black Start Service Providers** **Power Stations**. For each **Black Start Service Provider Power Station** The Company will state in the **Bilateral Agreement** whether or not a **Black Start Capability** is required.

Extract from ECC

ECC.6.3.5 BLACK START

ECC.6.3.5.1 **Black Start** is not a mandatory requirement, however **EU Code Users** may wish to notify **The Company** of their ability to provide a **Black Start** facility and the cost of the service. **The Company** will then consider whether it wishes to contract with the **EU Code User** for the provision of a **Black Start** service which would be specified via a **Black Start Contract**. Where an **EU Code User** does not offer to provide a cost for the provision of a **Black Start Capability**, **The Company** may make such a request if it considers **System** security to be at risk due to a lack of **Black Start** capability.

ECC.6.3.5.2 It is an essential requirement that the **National Electricity Transmission System** must incorporate a **Black Start Capability**. This will be achieved by agreeing a **Black Start Capability** at a number of strategically located **Power Stations** and **HVDC Systems**. For each **Power Station** or **HVDC System**, **The Company** will state in the **Bilateral Agreement** whether or not a **Black Start Capability** is required.

ECC.6.3.5.3 Where an **EU Code User** has entered into a **Black Start Contract** to provide a **Black Start Capability** in respect of a **Type C Power Generating Module** or **Type D Power Generating Module** (including **DC Connected Power Park Modules**) the following requirements shall apply.

(b) ~~(i)~~ The **Power-Generating Module** or **DC Connected Power Park Module** shall be capable of starting from shutdown without any external electrical energy supply within a time frame specified by **The Company** in the **Black Start Contract**.

(ii) Each **Power Generating Module** or **DC Connected Power Park Module** shall be able to synchronise within the frequency limits defined in ECC.6.1. and, where applicable, voltage limits specified in ECC.6.1.4;

(iii) The **Power Generating Module** or **DC Connected Power Park Module** shall be capable of connecting on to an ~~unenergised~~un-nenergized **System**.

(iv) The **Power-Generating Module** or **DC Connected Power Park Module** shall be capable of automatically regulating dips in voltage caused by connection of demand;

(v) The **Power Generating Module** or **DC Connected Power Park Module** shall:

be capable of **Block Load Capability**,

be capable of operating in **LFSM-O** and **LFSM-U**, as specified in ECC.6.3.7.1 and ECC.6.3.7.2

control **Frequency** in case of overfrequency and underfrequency within the whole **Active Power** output range between the **Minimum Regulating Level** and **Maximum Capacity** as well as at houseload operation levels be capable of parallel operation of a few **Power Generating Modules** including **DC Connected Power Park Modules** within an isolated part of the **Total System** that is still supplying **Customers**, and control voltage automatically during the system restoration phase;

ECC.6.3.5.4 Each **HVDC System** or **Remote End HVDC Converter Station** which has a **Black Start Capability** shall be capable of energising the busbar of an AC substation to which ~~thean~~ other **HVDC Converter Station** is connected. The timeframe after shutdown of the **HVDC System** prior to energisation of the AC substation shall be pursuant to the terms of the **Black Start Contract**. The **HVDC System** shall be able to synchronise within the **Frequency** limits defined in ECC.6.1.2.1.2 and voltage limits defined in ECC.6.1.4.1 unless otherwise specified in the **Black Start Contract**. **Wider Frequency** and voltage ranges can be specified in the **Black Start Contract** in order to restore **System** security.

ECC.6.3.5.5 With regard to the capability to take part in operation of an isolated part of the **Total System** that is still supplying **Customers**:

- (b) ~~(i)~~ **Power Generating Modules** including **DC Connected Power Park Modules** shall be capable of taking part in island operation if specified in the **Black Start Contract** required by **The Company** and:

the **Frequency** limits for island operation shall be those specified in ECC.6.1.2,

the voltage limits for island operation shall be those defined in ECC.6.1.4;

(ii) **Power Generating Modules** including **DC Connected Power Park Modules** shall be able to operate in **Frequency Sensitive Mode** during island operation, as specified in ECC.6.3.7.3. In the event of a power surplus, **Power Generating Modules** including **DC Connected Power Park Modules** shall be capable of reducing the **Active Power** output from a previous operating point to any new operating point within the **Power Generating Module Performance Chart**. **Power Generating Modules** including **DC Connected Power Park Modules** shall be capable of reducing **Active Power** output as much as inherently technically feasible, but to at least 55 % of **Maximum Capacity**;

(iii) The method for detecting a change from interconnected system operation to island operation shall be agreed between the **EU Generator**, **The Company** and the **Relevant Transmission Licensee**. The agreed method of detection must not rely solely on **The Company**, **Relevant Transmission Licensee's** or **Network Operators** switchgear position signals;

(iv) **Power Generating Modules** including **DC Connected Power Park Modules** shall be able to operate in **LFSM-O** and **LFSM-U** during island operation, as specified in ECC.6.3.7.1 and ECC.6.3.7.2;

ECC.6.3.5.6 With regard to quick re-synchronisation capability:

(b) ~~(i)~~ In case of disconnection of the **Power Generating Module** including **DC Connected Power Park Modules** from the **System**, the **Power Generating Module** shall be capable of quick re-synchronisation in line with the **Protection** strategy agreed between **The Company** and/or **Network Operator** in co-ordination with the **Relevant Transmission Licensee** and the **Generator**;

(ii) A **Power Generating Module** including a **DC Connected Power Park Module** with a minimum re-synchronisation time greater than 15 minutes after its disconnection from any external power supply must be capable of **Houseload Operation** from any operating point on its **Power Generating Module Performance Chart**. In this case, the identification of **Houseload Operation** must not be based solely on the **Total System's** switchgear position signals;

(iii) **Power Generating Modules** including **DC Connected Power Park Modules** shall be capable of **Houseload Operation**, irrespective of any auxiliary connection to the **Total System**. The minimum operation time shall be specified by **The Company**, taking into consideration the specific characteristics of prime mover technology.

Extract from OC5

OC5.7 BLACK START TESTING

OC5.7.1 General

(a) **The Company** shall may require a **-Black Start Service Provider** to carry out a **Black Start Test** in order to demonstrate that a **Black Start Station** or **Black Start HVDC System** has a **Black Start Capability**.

- (i) In the case of a Generator, The Company may shall require a **Generator** with a **Black Start Station** to carry out a test (a ~~"Black Start Test"~~) on a **Genset** in a **Black Start Station** ~~either while the Black Start Station remains connected to an external alternating current electrical supply (a "Black Start Unit Test") or while the Black Start Station is disconnected from all external alternating current electrical supplies (a "Black Start Station Test")~~, in order to demonstrate that a **Black Start Station** has a **Black Start Capability**.
 - (ii) In the case of an HVDC System Owner or DC Converter Station Owner, The Company shallmay require an **HVDC System Owner** or **DC Converter Station Owner** with a **Black Start HVDC System** to carry out a test (a **"Black Start HVDC Test"**) on a **HVDC System** or **DC Converter**, in order to demonstrate that a **Black Start HVDC System** has a **Black Start Capability**.
- (a) ~~The Company may require a Generator with a Black Start Station to carry out a test (a "Black Start Test") on a Genset in a Black Start Station either while the Black Start Station remains connected to an external alternating current electrical supply (a "BS Unit Test") or while the Black Start Station is disconnected from all external alternating current electrical supplies (a "BS Station Test"), in order to demonstrate that a Black Start Station has a Black Start Capability.~~
- (b) Where The Company requires a Black Start Service Provider to undertake testing, the following requirements shall apply:-
- (i) Where The Company requires a **Generator** with a **Black Start Station** to carry out a **Black Start Unit Test**, on each **Genset**, which has **Black Start Capability**, within such a **Black Start Station**, ~~the Generator shall to demonstrate execute such a test~~ at least once every three years. **The Company** shall not require the **Black Start Test Unit** to be carried out on more than one **Genset** at that **Black Start Station** at the same time, and would not, in the absence of exceptional circumstances, expect any of the other **Gensets** at the **Black Start Station** to be directly affected by the **Black Start Unit Test**.
 - ~~(ii) Where The Company requires a Black Start HVDC System Owner or DC Converter Station Owner to carry out a Black Start HVDC Test, the Black Start HVDC System Owner or DC Converter Station Owner shall execute a Black Start HVDC Test at least once every three years.~~
- ~~Theis above tests~~ will be deemed a success where starting from **Sshutdown** is achieved ~~within a time frame specified by The Company and which may be agreed in any relevant contact, the Black Start Contract.~~
- c) **The Company** may require a **Generator** to carry out with a Black Start Unit Test Station to carry out a BS Unit Test at any time (but will not require a **Black Start Unit Test** to be carried out more than once in each calendar year in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).
 - (d) Occasionally, **The Company**, may require a **Black Start Service Provider Generator with a Black Start Station** to carry out a **Black Start Station Test** at any time.
 - (i) In the case of the Generator with a Black Start Station, The Company may require the Generator to carry out a Black Start Station Test at any time (but will not require a **Black Start Station Test** to be carried out more than once in every two calendar years in respect of any particular **Genset** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test). If successful this **Black Start Station Test** shall count as a successful **Black Start Unit Test** for the **Genset** used in the test.

(ii) In the case of an HVDC System Owner or DC Converter Station Owner with a Black Start HVDC System, The Company may require the HVDC System Owner or DC Converter Station Owner to carry out a Black Start HVDC Test at any time (but will not require such a test to be carried out more than once in every two calendar years unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).

(e) When The Company wishes a ~~Generator~~ **Black Start Service Provider** ~~with a Black Start Station~~ to carry out a **Black Start Test**, it shall notify the relevant ~~Generator~~ **Black Start Service Provider** at least 7 days prior to the time of the **Black Start Test** with details of the proposed **Black Start Test**.

OC5.7.2 Procedure ~~f~~For ~~a~~A Black Start Test

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

OC5.7.2.1 **Black Start** Unit Tests

- (a) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**;
- (b) All the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** in the **Black Start Station** in which that **Generating Unit** is situated, shall be **Shutdown**.
- (c) The **Generating Unit** shall be **De-Loaded** and **De-Synchronised** and all alternating current electrical supplies to its **Auxiliaries** shall be disconnected.
- (d) The **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** to the relevant **Generating Unit** shall be started, and shall re-energise the **Unit Board** of the relevant **Generating Unit**.
- (e) The **Auxiliaries** of the relevant **Generating Unit** shall be fed by the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)**, via the **Unit Board**, to enable the relevant **Generating Unit** to return to **Synchronous Speed**.
- (f) The relevant **Generating Unit** shall be **Synchronised** to the **System** but not **Loaded**, unless the appropriate instruction has been given by **The Company** under **BC2**.

(g) In respect of **EU Generators**, the above tests defined in OC5.7.2.1(a) – (e) shall be in accordance with the requirements of ECC.6.3.5.3.

OC5.7.2.2 **Black Start** Station Test

- (a) All **Generating Units** at the **Black Start Station**, other than the **Generating Unit** on which the **Black Start Test** is to be carried out, and all the **Auxiliary Gas Turbines** and/or **Auxiliary Diesel Engines** at the **Black Start Station**, shall be **Shutdown**.
- (b) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**.
- (c) The relevant **Generating Unit** shall be **De-Loaded** and **De-Synchronised**.
- (d) All external alternating current electrical supplies to the **Unit Board** of the relevant **Generating Unit**, and to the **Station Board** of the relevant **Black Start Station**, shall be disconnected.
- (e) An **Auxiliary Gas Turbine** or **Auxiliary Diesel Engine** at the **Black Start Station** shall be started, and shall re-energise either directly, or via the **Station Board**, the **Unit Board** of the relevant **Generating Unit**.

(f) The provisions of OC5.7.2.1 (e) and (f) shall thereafter be followed.

(g) In respect of **EU Generators**, the above tests defined in OC5.7.2.2(a) – (e) shall be in accordance with the requirements of ECC.6.3.5.3.

OC5.7.2.3 Procedure for a **Black Start HVDC Test**

- a) The **HVDC System** or **DC Converter Station** shall demonstrate its technical capability to energise the busbar of the de-energised AC substation to which it is connected, within the **GB Synchronous Area** within a timeframe specified by **The Company**. In the case of **HVDC Systems** this shall be in accordance with the requirements of ECC.6.3.5.4.; As part of this test, all **Auxiliaries** are required to be derived from within the **HVDC System** or **DC Converter Station**.
- b) The test shall be carried out while the **HVDC System** or **DC Converter Station** starts from **HVDC System Shutd-Down**;
- c) The test shall be deemed passed, provided that the following conditions are cumulatively fulfilled:
 - i) The **HVDC System Owner** has demonstrated its **HVDC System** or **DC Converter Station** is able to energise the busbar of the isolated AC-substation to which it is connected within the **GB Synchronous Area**;
 - ii) The **HVDC System** or **DC Converter Station** can achieve a stable operating point at an agreed capacity as agreed with **The Company**

OC5.7.2.43 All **Black Start Tests** shall be carried out at the time specified by **The Company** in the notice given under OC5.7.1 (fd) and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by **The Company**, who shall be given access to all information relevant to the **Black Start Test**.

OC5.7.2.54 Failure of a Black Start Test

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

OC5.7.2.65 If a **Black Start Station** or **Black Start HVDC System** fails to pass a **Black Start Test** the **Black Start Service ProviderGenerator** must provide **The Company** with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the **Generator-Black Start Service Provider** after due and careful enquiry. This must be provided within five **Business Days** of the test. If a dispute arises relating to the failure, **The Company** and the relevant **Black Start Service ProviderGenerator** shall seek to resolve the dispute by discussion, and if they fail to reach agreement, the **Black Start Service ProviderGenerator** may require **The Company** to carry out a further **Black Start Test** on 48 hours notice which shall be carried out following the procedure set out in OC5.7.2.1 or OC5.7.2.2 as the case may be, as if **The Company** had issued an instruction at the time of notice from the **Black Start Service ProviderGenerator**.

OC5.7.2.76 If the **Black Start Station** or **Black Start HVDC System** concerned fails to pass the re-test and a dispute arises on that re-test, either party may use the **Disputes Resolution Procedure** for a ruling in relation to the dispute, which ruling shall be binding.

OC5.7.2.87 If following the procedure in OC5.7.2.65 and OC5.7.2.76 it is accepted that the **Black Start Station or Black Start HVDC System** has failed the **Black Start Test** (or a re-test carried out under OC5.7.2.5), within 14 days, or such longer period as **The Company** may reasonably agree, following such failure, the relevant **Black Start Service ProviderGenerator** shall submit to **The Company** in writing for approval, the date and time by which that **Black Start Service ProviderGenerator** shall have brought that **Black Start Station or Black Start HVDC System** to a condition where it has a **Black Start Capability** and would pass the **Black Start Test**, and **The Company** will not unreasonably withhold or delay its approval of the **Black Start Service Provider'sGenerator's** proposed date and time submitted. Should **The Company** not approve the **Black Start Service Provider'sGenerator's** proposed date and time (or any revised proposal) the **Black Start Service ProviderGenerator** shall revise such proposal having regard to any comments **The Company** may have made and resubmit it for approval.

OC5.7.2.98 Once the **Black Start Service ProviderGenerator** has indicated to **The Company** that the **Generating Station or HVDC System or DC Converter Station** has a **Black Start Capability**, **The Company** shall either accept this information or require the **Black Start Service ProviderGenerator** to demonstrate that the relevant **Black Start Station or Black Start HVDC System** has its **Black Start Capability** restored, by means of a repetition of the **Black Start Test** referred to in OC5.7.1(d) following the same procedure as for the initial **Black Start Test**. The provisions of this OC5.7.2 will apply to such test.



Extracts from OC9

OC9.4.5 Black Start Service ProvidersStations

OC9.4.5.1 ~~Certain Power Stations ("Black Start Stations") and HVDC Systems ("Black Start HVDC Systems") are registered, pursuant to the Bilateral Agreement with a User, as Black Start Service Providers are registered pursuant to the Bilateral Agreement as having the an capability 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 The Company within two hours, without an external electrical power supply ("Black Start Capability").~~

OC9.4.5.2 -For each **Black Start Station and Black Start HVDC System**, a **Local Joint Restoration Plan** will be produced jointly by **The Company**, the relevant **Black Start Service ProviderGenerator** and **Network Operator** in accordance with the provisions of OC9.4.7.12. 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**) and Black Start HVDC Systems will energise part of the **Total System** and meet complementary local **Demand** so as to form a **Power Island**.

OC9.4.5.3 In respect of **Scottish Transmission Systems**, a **Local Joint Restoration Plan** may cover more than one **Black Start Station or Black Start HVDC System** and may be produced with and include obligations on **Relevant Scottish Transmission Licensees, Generators** responsible for **Gensets** not at a **Black Start Station** and other **Users including HVDC System Owners and DC Converter Station Owners**.

OC9.4.6 **Black Start Situation**

In the event of a **Total Shutdown** or **Partial Shutdown**, **The Company** will, as soon as reasonably practical, inform **Users** (or, in the case of a **Partial Shutdown**, **Users** which in **The Company'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 **The Company** intends to implement a **Black Start**. **The Company** shall (as soon as is practicable) determine, in its reasonable opinion, the time and date with effect from which the **Total Shutdown** or **Partial Shutdown** commenced and notify the BSCCo of that time and date.

In the event of a **Total Shutdown** and following such notification, in accordance with the provisions of the **BSC**, the **BSCCo** will determine the **Settlement Period** with effect from which the **Balancing Mechanism** is suspended.

In the event of a **Partial Shutdown** and following such notification, the **Balancing Mechanism** will not be suspended until such time and date that the **Market Suspension Threshold** has been met, or deemed to have been met, in accordance with the provisions of the **BSC**. **The Company** shall carry out the monitoring activities required by paragraph G3.1 of the **BSC**.

Following determination by **The Company** pursuant to its obligations under the **BSC** that the **Market Suspension Threshold** has been met, or deemed to have been met, **The Company** shall (as soon as practicable) inform the **BSCCo** of that time and date at which the **Market Suspension Threshold** was met, or deemed to have been met, and the **BSCCo** will determine the **Settlement Period** in accordance with the provisions of the **BSC** with effect from which the **Balancing Mechanism** will be suspended.

Should **The Company** determine that the **Total System** is capable of returning to normal operation without meeting the **Market Suspension Threshold**, **The Company** will follow the procedure given in OC9.4.7.9.

The **Black Start** will conclude with effect from the time and date determined in accordance with OC9.4.7.10.

In respect of **Scottish Transmission Systems**, in exceptional circumstances, as specified in the **Local Joint Restoration Plan**, **SPT** or **SHETL**, may invoke such **Local Joint Restoration Plan** for its own **Transmission System** and **Scottish Offshore Transmission Systems** connected to it 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**, **HVDC System**, **DC Converter Station** 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**, or HVDC System or DC Converter Stations, 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 Island**) and eventually re-establishment of the complete **Total System**.

The Company Instructions

OC9.4.7.3 The procedures for a **Black Start** will, therefore, be those specified by **The Company** at the time. These will normally recognise any applicable **Local Joint Restoration Plan**. **Users** shall abide by **The Company'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**. **The Company's** instructions may (although this list should not be regarded as exhaustive) be to a **Black Start Station or Black Start HVDC System** 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 or HVDC System or DC Converter 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 respect of **Scottish Transmission Systems**, **SPT** and **SHETL** will act on **The Company's** behalf in accordance with its duties under the relevant **Local Joint Restoration Plan**. **Scottish Users** shall abide by **SPT's** or **SHETL's** instructions given in accordance with the **Local Joint Restoration Plan** during a **Black Start** situation.

OC9.4.7.4

(a) **Black Start** following a **Total Shutdown** or where the **Balancing Mechanism** has been suspended following a **Partial Shutdown**

During a **Black Start** situation where the **Balancing Mechanism** has been suspended, all instructions to ~~**Users and Power Stations**~~ and to ~~**Network Operators**~~ will be deemed to be **Emergency Instructions** under BC2.9.2.2 (iii). All such **Emergency Instructions** 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 **BC**). For the purposes of these instructions the **Black Start** will be an emergency circumstance under BC2.9.

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

(b) **Black Start** following a **Partial Shutdown** where the **Balancing Mechanism** has not been suspended

During a **Black Start** situation where the **Balancing Mechanism** has not been suspended, instructions in relation to **Black Start Stations**, **Black Start HVDC Systems** and to **Network Operators** which are part of an invoked **Local Joint Restoration Plan** will (unless **The Company** specifies otherwise) be deemed to be **Emergency Instructions** under BC2.9.2.2 (iv) 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 **BC**). For the purposes of these instructions the **Black Start** will be an emergency circumstance under BC2.9.

During a **Black Start** situation where the **Balancing Mechanism** has not been suspended, **The Company** may issue instructions to **Users** other than **Black Start Stations** and **Network Operators** which are part of an invoked **Local Joint Restoration Plan**. Such instructions would be **Emergency Instructions** pursuant to BC2.9.1.2(e)(i) subject to the requirements of BC2.9.2.2 being met.

In Scotland, **Gensets** and **HVDC Systems** or **DC Converter Station** that are not at **Black Start Stations** or **Black Start HVDC Systems**, but which are part of an invoked **Local Joint Restoration Plan**, may be instructed in accordance with the provisions of that **Local Joint Restoration Plan**.

(c) If during the **Demand** restoration process any **Genset or HVDC System or DC Converter Station** cannot, because of the **Demand** being experienced, keep within its safe operating parameters, the **Black Start Service ProviderGenerator** shall, unless a **Local Joint Restoration Plan** is in operation, inform **The Company**. **The Company** will, where possible, either instruct **Demand** to be altered or will re-configure the **National Electricity Transmission System** or will instruct a **User** to re-configure its **System** in order to alleviate the problem being experienced by the **Generator or HVDC Systems or DC Converter Station**. If a **Local Joint Restoration Plan** is in operation, then the arrangements set out therein shall apply. However, **The Company** accepts that any decision to keep a **Genset or HVDC System or DC Converter Station** operating, if outside its safe operating parameters, is one for the **Black Start Service ProvidersGenerator** concerned alone and accepts that the **Black Start Service ProviderGenerator** may change generation output on that **Genset or HVDC System or DC Converter Station** 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 **Black Start Service ProviderGenerator** shall inform **The Company** 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 or Embedded HVDC Systems or Embedded DC Converter Stations** will comply with any directions of **The Company** 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, **The Company** 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, **The Company** shall state whether or not it wishes the remainder of the **Local Joint Restoration Plan** to apply. If, notwithstanding that **The Company** has stated that it wishes the remainder of the **Local Joint Restoration Plan** to apply, the **Black Start Service ProviderGenerator** or the relevant **Network Operator** consider that **The Company'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 **The Company** and the other parties to the **Local Joint Restoration Plan** to this effect and **The Company** 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 **The Company**, as part of a **Black Start**, has given an instruction to a **Black Start Service ProviderBlack Start Station** to initiate **Start-Up**, the relevant **Genset(s)** at the **Black Start Station or Black Start HVDC System** will **Start-Up** in accordance with the **Local Joint Restoration Plan**.

(c) **The Company** 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) **The Company** will ensure that switching carried out on the **National Electricity Transmission System** and other actions are as set out in the **Local Joint Restoration Plan**.

(e) Following notification from the **Black Start Service Provider** that the **Black Start Station or Black Start HVDC System** is ready to accept load, **The Company** will instruct the **Black Start Service Provider** to energise part of the **Total System**. The **Black Start Service Provider** 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/or HVDC System and/or DC Converter Station~~ and the connection of **Demand** so as to establish a **Power Island**. During this period, the **Black Start Service Provider** will be required to regulate the output of the relevant **Genset(s)** ~~at its Black Start Station or Black Start HVDC System~~ 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 or Black Start HVDC System** 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 **The Company** (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 or HVDC Systems or DC Converter Station** (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 **The Company** 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 The Company**.

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

Interconnection of Power Islands

OC9.4.7.7 **The Company** 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. The 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 **The Company** 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 **The Company** of their actions and will not **Re-Synchronise** to the **National Electricity Transmission System** or any **User's System** which is already **Synchronised** to the **National Electricity Transmission System** without **The Company's** agreement.



Return the Total System Back to Normal Operation

OC9.4.7.9 **The Company** shall, as soon as reasonably practical, inform **Users** and the **BSCCo** when the **Total System** could return to normal operation. Any such determination by **The Company** does not mean that the provisions of Section G paragraph 3 (**Black Start**) of the **BSC** shall cease to apply.

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

(a) the extent to which the **National Electricity Transmission System** is contiguous and energised;

(b) the integrity and stability of the **National Electricity 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 **National Electricity Transmission System**; and

(e) the functionality of normal communication systems (i.e. electronic data communication facilities, **Control Telephony**, etc).

In the event that the **Balancing Mechanism** has been suspended, it will not resume until the start of the **Settlement Period** determined by the **BSC Panel** in accordance with paragraph G3.1.2(d)(i) of the **BSC**.

For the avoidance of doubt, until resumption of the **Balancing Mechanism**, **The Company** is likely to continue to issue **Emergency Instructions** in accordance with BC2.9.

Users shall use reasonable endeavours to submit **Physical notifications** ten hours prior to the start of the **Settlement Period** determined by the **BSC Panel** in accordance with paragraph G3.1.2(d)(i) of the **BSC** and as notified by **The Company** to **Users**, in preparation for a return to normal operations.

In the event that the **Balancing Mechanism** has not been suspended and **The Company** has determined that the **Total System** has returned to normal operation, **The Company** shall inform **Users** and the **BSCCo** as soon as possible of the time and date at which (in **The Company's** determination) the **Total System** returned to normal operation.

Conclusion of Black Start

OC9.4.7.10 The provisions of this **OC9** shall cease to apply with effect from either:

(a) Where the **Balancing Mechanism** was suspended, the start of the **Settlement Period** that the **Balancing Mechanism** resumed normal operation, as determined by the **BSC Panel** and notified by the **BSCCo** in accordance with the provisions of the **BSC**; or

(b) Where the **Balancing Mechanism** was not suspended, the end of the **Settlement Period** determined and notified by the **BSCCo** (in accordance with the provisions of the **BSC**) and corresponding to the time and date that **The Company** determined that the **Total System** had returned to normal operation.

Externally Interconnected System Operators

OC9.4.7.11 During a **Black Start**, **The Company** 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.

OC9.4.7.12 Local Joint Restoration Plan Establishment

(a) In England and Wales, in relation to each **Black Start Station** and each **Black Start HVDC System**, **The Company**, **NGET**, the **Network Operator** and the relevant **Black Start Service Provider** ~~Generator~~ will discuss and agree a **Local Joint Restoration Plan**. Where at the date of the first inclusion of this OC9.4.7.12 into the **Grid Code** a local plan covering the procedures to be covered in a **Local Joint Restoration Plan** is in

existence and agreed, **The Company** will discuss this with **NGET**, the **Network Operator** ~~and and~~ the relevant **Generator** ~~or~~ **HVDC System Owner** ~~or~~ **DC Converter Station Owner** 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 OC9.4.7.12(b) shall apply. If it is not agreed to be so consistent, then the provisions of OC9.4.7.12(b) shall apply as if there is no **Local Joint Restoration Plan** in place.

In respect of **Scottish Transmission Systems** where a requirement for a **Local Joint Restoration Plan** is identified, **The Company**, the **Relevant Scottish Transmission Licensee(s)**, the **Network Operator** and **Black Start Service Provider's Black Start Station(s)** will discuss and agree a **Local Joint Restoration Plan**. In addition other **Users**, including other **Generators** ~~or~~ **HVDC Systems Owners** ~~or~~ **DC Converter Station Owners**, may be reasonably required by **The Company** 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) **The Company**, **NGET**, the **Network Operator** and the relevant **Black Start Service Provider** ~~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 **The Company**. **The Company** 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** ~~or~~ **Black Start HVDC System**.

(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 **The Company**, **NGET** and each **User** should a **Black Start** situation arise.

(iv) Each **Local Joint Restoration Plan** shall be prepared by **The Company** 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 **The Company** to **NGET** and 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 **The Company** and on behalf of **NGET** and each relevant **User** by way of written confirmation of its accuracy.

(viii) Once agreed under this OC9.4.7.12, 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 **The Company** and **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 **The Company** to **NGET** and each **User** which is a party to it accompanied by a note indicating the date of implementation.

(x) **The Company**, **NGET** and **Users** must make the **Local Joint Restoration Plan** readily available to the relevant operational staff.

(xi) If **The Company**, or **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 **The Company**) initiate a discussion between **The Company** and the relevant **Users** to seek to agree the relevant change. If **NGET** or a **User** becomes so aware, it shall contact **The Company** who will then initiate such discussions. The principles applying to establishing a new **Local Joint Restoration Plan** under this OC9.4.7.12 shall apply to such discussions and to any consequent changes.

(xii) **The Company, NGET, the Network Operator, and the relevant Generator, or the relevant HVDC System Owner and the relevant DC Converter Station Owner** 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**.

The Company will propose to the parties of a **Local Joint Restoration Plan** a date 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 respect of **Scottish Transmission Systems**, where the need for a **Local Joint Restoration Plan** arises, the following provisions shall apply:

(i) **The Company, the Relevant Scottish Transmission Licensee(s), the Network Operator and the relevant Black Start Service Provider 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 **The Company**. In addition, other **Scottish Users**, including other **Generators, and HVDC Systems Owners and DC Converter Station Owners**, may be reasonably required by **The Company** 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 **The Company**. **The Company** will notify the **Relevant Scottish Transmission Licensee(s)** and all affected **Scottish 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** ~~or other HVDC Systems than a Black Start HVDC System~~. Each Local Joint Restoration Plan could equally apply to a specific Black Start HVDC System or a number of Black Start HVDC Systems and may include HVDC Systems or DC Converter Stations other than a Black Start HVDC System. For the avoidance of doubt, this would not preclude a Local Joint Restoration Plan from comprising a combination of Power Stations, HVDC Systems or DC Converter Stations irrespective of whether they have a Black Start Capability.

(iii) The **Local Joint Restoration Plan** will record which **Scottish Users** and which **Scottish User Sites** are covered by the **Local Joint Restoration Plan** and set out what is required from **The Company, the Relevant Scottish Transmission Licensee(s)** and each **Scottish User** should a **Black Start** situation arise.

(iv) Each **Local Joint Restoration Plan** shall be prepared by **The Company** 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 **The Company** to the **Relevant Scottish Transmission Licensee(s)** and **Scottish 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 **The Company** and on behalf of each relevant **Scottish User** and **Relevant Scottish Transmission Licensee(s)** by way of written confirmation of its accuracy.

(viii) Once agreed under this OC9.4.7.12, 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 **The Company**, **Relevant Scottish Transmission Licensee(s)** and the relevant **Scottish 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 **The Company** to the **Relevant Scottish Transmission Licensee(s)** and each **Scottish User** which is a party to it accompanied by a note indicating the date of implementation.

(x) **The Company**, the **Relevant Scottish Transmission Licensee(s)** and **Scottish Users** must make the **Local Joint Restoration Plan** readily available to the relevant operational staff.

(xi) If **The Company**, the **Relevant Scottish Transmission Licensee(s)** or any **Scottish 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 **The Company**) initiate a discussion between **The Company**, the **Relevant Scottish Transmission Licensee(s)** and the relevant **Scottish Users** to seek to agree the relevant change. If a **Scottish User** or a **Relevant Scottish Transmission Licensee** becomes so aware, it shall contact **The Company** who will then initiate such discussions. The principles applying to establishing a new **Local Joint Restoration Plan** under this OC9.4.7.12 shall apply to such discussions and to any consequent changes.

(xii) **The Company**, the **Relevant Scottish Transmission Licensee(s)**, the **Network Operator** and the relevant **Black Start Service Provider** 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**.

The Company will propose to the parties of a **Local Joint Restoration Plan** a date 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.

Emergency Instructions will always be prefixed with the words “This is an **Emergency Instruction**” except in the case of:

- (i) **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) an **Emergency Deenergisation Instruction**, where the **Emergency Deenergisation Instruction** will be pre-fixed with the words ‘This is an **Emergency Deenergisation Instruction**’; and
- (iii) during a **Black Start** situation where the **Balancing Mechanism** has been suspended, any instruction given by **The Company** will (unless **The Company** specifies otherwise) be deemed to be an **Emergency Instruction** and need not be pre-fixed with the words ‘This is an **Emergency Instruction**’; and
- (iv) during a **Black Start** situation where the **Balancing Mechanism** has not been suspended, any instruction in relation to **Black Start Stations**, **Black Start HVDC Systems** and to **Network Operators** which are part of an invoked **Local Joint Restoration Plan** will (unless **The Company** specifies otherwise) be deemed to be an **Emergency Instruction** and need not be prefixed with the words ‘This is an **Emergency Instruction**’.

In Scotland, any instruction in relation to **Gensets** or HVDC Systems or DC Converter Station that are not at **Black Start Stations** or at Black Start HVDC Systems, but which are part of an invoked **Local Joint Restoration Plan** and are instructed in accordance with the provisions of that **Local Joint Restoration Plan**, will be deemed to be an **Emergency Instruction** and need not be prefixed with the words ‘This is an **Emergency Instruction**’.



Extract from DRC schedule 16

SCHEDULE 16 - BLACK START INFORMATION

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PART I

<p>BLACK START INFORMATION</p> <p>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-Generating Modules, 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 The Company during a Black Start.</p>				
Data Description	Units	Data Category		
(PC.A.5.7) (■ CUSC Contract)				
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 II		
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 II		
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 49.5Hz – 50.5Hz. The data should identify any required 'hold' points.	Tabular or Graphical	DPD II		

SCHEDULE 16 - BLACK START INFORMATION

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PART II

<p>BLACK START INFORMATION</p> <p>The following data/text items are required from each HVDC System Owner for each HVDC System and DC Converter Station Owner that are contracted to provide a Black Start. The data should be provided in accordance with PC.A.1.2 and also, where possible, upon request from The Company during a Black Start.</p>				
<u>Data Description</u>	<u>Units</u>	<u>Data Category</u>		
(PC.A.5.7) (■ <i>CUSC Contract</i>)				
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 II		
b) Describe any likely issues that would have a significant impact on a BM Units time to be Synchronised arising as a direct consequence of the inherent design or operational practice of the HVDC System or DC Converter Station and/or BM Unit , e.g. time from a Total Shutdown or Partial Shutdown at which batteries would be discharged.	Text	DPD II		
Block Loading Capability:				
c) Provide estimated incremental Active Power steps, from no load to Rated MW which an HVDC System or DC Converter Station can instantaneously supply without causing it to trip or go outside the Frequency range of 47.5Hz – 52Hz (or an otherwise agreed Frequency range). The time between each incremental step shall also be provided. In addition data should be provided from 0MW to Registered Capacity of each BM Unit based on the HVDC System or DC Converter Station being (not run for 48hrs or more prior to the shutdown) or run immediately before the Partial Shutdown or Total Shutdown . The data supplied should be valid for a Frequency deviation of 49.5Hz – 50.5Hz and should identify any required 'hold' points.	Tabular or Graphical	DPD II		