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| <h1 style="margin: 0;">GC0125</h1> <p style="margin: 10px 0 0 0;"><b>Mod Title:</b> EU Code Emergency &amp; Restoration: Black Start testing requirements for Interconnectors</p> | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center; width: 30px;">01</td> <td style="border: 1px solid black; border-radius: 5px; background-color: #00a651; color: white; padding: 2px;">Proposal Form</td> </tr> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center;">02</td> <td style="border: 1px solid black; border-radius: 5px; padding: 2px;">Workgroup Consultation</td> </tr> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center;">03</td> <td style="border: 1px solid black; border-radius: 5px; padding: 2px;">Workgroup Report</td> </tr> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center;">04</td> <td style="border: 1px solid black; border-radius: 5px; padding: 2px;">Code Administrator Consultation</td> </tr> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center;">05</td> <td style="border: 1px solid black; border-radius: 5px; padding: 2px;">Draft Grid Code Modification Report</td> </tr> <tr> <td style="border: 1px solid black; border-radius: 5px; text-align: center;">06</td> <td style="border: 1px solid black; border-radius: 5px; padding: 2px;">Final Grid Code Modification Report</td> </tr> </table> | 01 | Proposal Form | 02 | Workgroup Consultation | 03 | Workgroup Report | 04 | Code Administrator Consultation | 05 | Draft Grid Code Modification Report | 06 | Final Grid Code Modification Report |
| 01                                                                                                                                                                                | Proposal Form                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |
| 02                                                                                                                                                                                | Workgroup Consultation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |
| 03                                                                                                                                                                                | Workgroup Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |
| 04                                                                                                                                                                                | Code Administrator Consultation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |
| 05                                                                                                                                                                                | Draft Grid Code Modification Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |
| 06                                                                                                                                                                                | Final Grid Code Modification Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |               |    |                        |    |                  |    |                                 |    |                                     |    |                                     |

**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><b>The Proposer recommends that this modification should be:</b></p> <ul style="list-style-type: none"> <li>assessed by a Workgroup</li> </ul> <p>This modification was raised 20 March 2019 and will be presented by the Proposer to the Panel on 28 March 2019. The Panel will consider the Proposer’s recommendation and determine the appropriate route.</p> |
|  | <p><b>High Impact:</b> Electricity System Operator (ESO), external Transmission System Operators (TSOs), Interconnectors wishing to provide Black Start.</p>                                                                                                                                                                                                        |
|  | <p><b>Medium Impact:</b> None.</p>                                                                                                                                                                                                                                                                                                                                  |
|  | <p><b>Low Impact:</b> None.</p>                                                                                                                                                                                                                                                                                                                                     |

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| Timetable                                                                   |                                           |  Matthew.Bent@nationalgrid.com                                                                            |
| <b>The Code Administrator recommends the following expedited timetable:</b> |                                           |  07785428175                                                                                              |
| Initial consideration by Workgroup                                          | May 2019                                  | <b>Proposer:</b><br>Rachel Woodbridge-Stocks                                                                                                                                                 |
| Modification concluded by Workgroup                                         | 19 July 2019                              |  <a href="mailto:Rachel.Woodbridgestocks@nationalgrid.com">Rachel.Woodbridgestocks@nationalgrid.com</a>   |
| Workgroup Report presented to Panel                                         | 30 July 2019                              |  07976708078                                                                                              |
| Code Administration Consultation Report issued to the Industry              | August 2019                               | <b>National Grid Representative:</b><br>Rachel Woodbridge-Stocks                                                                                                                             |
| Draft Final Modification Report presented to Panel                          | 26 September 2019                         |  <a href="mailto:Rachel.Woodbridgestocks@nationalgrid.com">Rachel.Woodbridgestocks@nationalgrid.com</a> |
| Modification Panel decision                                                 | 26 September 2019                         |  07976708078                                                                                            |
| Final Modification Report issued the Authority                              | 11 October 2019                           |                                                                                                                                                                                              |
| Decision implemented into the Grid Code                                     | 13 December 2019                          |                                                                                                                                                                                              |

## Proposer Details

|                                                                                                                             |                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Details of Proposer:</b><br>(Organisation Name)                                                                          | Rachel Woodbridge-Stocks<br>(National Grid Electricity System Operator,<br>NGESO) |
| Capacity in which the Grid Code<br>Modification Proposal is being<br>proposed:<br>(e.g. CUSC Party)                         | System Operator                                                                   |
| <b>Details of Proposer's<br/>         Representative:</b><br>Name:<br>Organisation:<br>Telephone Number:<br>Email Address:  |                                                                                   |
| <b>Details of Representative's<br/>         Alternate:</b><br>Name:<br>Organisation:<br>Telephone Number:<br>Email Address: |                                                                                   |
| <b>Attachments (Yes/No): No</b><br><b>If Yes, Title and No. of pages of each Attachment:</b>                                |                                                                                   |

## 1 Summary

### Defect

The Grid Code doesn't currently include black start testing requirements for interconnectors, whereas the [Emergency and Restoration Code \(E&R\)](#) 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 21<sup>st</sup> November 2018. E&R also sets out testing requirements for interconnectors 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.

## Why

The requirements need to be added to the Grid Code to reflect the testing requirements that will be necessary as of 17<sup>th</sup> December 2019.

## How

This modification proposes to align the testing requirements set out in the Emergency and Restoration code with GB frameworks by adding the requirements in OC.5.7 of the Operating Code within the Grid Code.

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.

## 2 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 18<sup>th</sup> December 2019.

### Requested Next Steps

This modification should:

- be assessed by a Workgroup

Following the feedback received for GC0108 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.

## 3 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 a network code on emergency and restoration came into force on 18 December 2017. The Emergency and Restoration network code 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.

## 4 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>

## 5 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.

## 6 Impacts & Other Considerations

Interconnectors wishing to deliver a black start service will be affected 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 not wishing to offer this service will not be affected.

Systems impacted include NGENSO Black Start testing.

**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 and Restoration 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.

## 7 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          |
| (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          |
| (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          |
| (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          |
| (e) To promote efficiency in the implementation and administration of the Grid Code arrangements                                                                                                                                                                                                                                                                     | None              |

- a) Permits the development, maintenance and operation of an efficient, coordinated and economical system by ensuring all providers of the black start service are following the same compliance testing requirements and aligns GB with other European member states.
- b) 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) Encouraging more black start providers will allow for additional system security should a black start event ever occur.
- d) Discharges the obligations of the Emergency and Restoration code into GB frameworks.

## 8 Implementation

GB is required to have implemented the System Defence and Restoration Plans by 18<sup>th</sup> December 2019, therefore this modification needs to have been approved and implemented by this deadline.

## 9 Technical Solution

This is an initial draft of what the technical solution may look like but will be subject to change following the workgroup assessment.

### 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:

|                                     |                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b><u>HVDC Black Start Test</u></b> | <u>A Black Start Test carried out by a <b>HVDC System</b> on the instructions of <b>The Company</b>.</u> |
|-------------------------------------|----------------------------------------------------------------------------------------------------------|

OC5.7 BLACK START TESTING

OC5.7.3 HVDC Systems Black Start Tests

A **HVDC System** delivering a **Black Start** service shall execute a **HVDC Black Start Test** at least every three years following the procedure detailed in OC5.7.3.1.

OC5.7.3.1 Procedure for **HVDC Black Start Test**

- 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 timeframe specified by **The Company** in accordance with ECC.6.3.5.4;



- 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 ECC.6.3.5.1.

## 10 Recommendations

### Proposer's Recommendation to Panel

Panel is asked to:

- Agree that Normal governance procedures should apply; and
- Refer this proposal to a Workgroup for assessment.

## 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.