

nationalgridESO

# EU NCER: System Restoration Plan

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# EU NCER: System Restoration Plan

## 1 Version Control

Version	Date	Author	Rationale
Issue 1	Dec 2018	NGESO	By December 2018, each TSO shall notify the regulatory authority of the system restoration plan designed pursuant to Article 23.
Issue 2	July 2019	NGESO	Further detail added to define SGU's and outline the plan review.
Issue 3	December 2019	NGESO	Updates to the SGU list and High Priority SGUs. Updates to glossary and definitions. Updated to reflect compliance requirements for implementation of NCER by December 2019.
Issue 4	May 2022	NGESO	Refresh of document to reflect Grid Code updates (GC0096, GC0125, GC0127, GC0128, GC0144 GC0147 and GC0148) and approval of SGU list, T&Cs, and Test Plan.
Issue 5	April 2023	NGESO	Refresh of document to reflect implementation of the Electricity System Restoration Standard (GC0156), Distributed -Re-Start and Test Plan.

## 2 Introduction

The European Network Code on Emergency & Restoration<sup>1</sup> (EU NCER) came into force on 18 December 2017 and this document is NGESO's approach to discharging the requirement in that Network Code which requires preparation of a System Restoration Plan. This System Restoration Plan has been developed in consultation with industry stakeholders. This document does not include the Distributed Re-Start arrangements which are being addressed through the future Electricity System Restoration Standard work.

As provided for in the EU NCER Article 23, this System Restoration Plan has been designed in consultation with Stakeholders in the GB Synchronous Area. GB Parties who will be required to comply with the requirements of the EU NCER are detailed in Appendix A of this System Restoration Plan. In general, the EU NCER applies to the following parties in GB.

<sup>1</sup>Network Code on Emergency and Restoration

[http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2017.312.01.0054.01.ENG&toc=OJ:L:2017:312:TOC](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.312.01.0054.01.ENG&toc=OJ:L:2017:312:TOC)



- Any Party with a CUSC Contract;
- Any Non-CUSC Party with a Anchor Restoration Contract or Top Up Restoration eContract with NGESO to provide a Restoration Service;
- NGESO;
- Transmission Licensees; and
- Network Operators.

This Plan is not intended to replace any provisions currently in place in the GB Industry Codes nor to amend the Operational Security Limits<sup>2</sup>, it is a summary of how the requirements for System Restoration specified in the EU NCER are satisfied in GB. The provisions contained within this System Restoration Plan are already described in the GB national codes (e.g. Grid Code, CUSC, STC, BSC, etc.). For the avoidance of doubt, the mandatory requirements placed on Parties are defined in the industry codes developed through the industry code governance process and not through this System Restoration Plan. For Non-CUSC Parties who have an Anchor Restoration Contract or Top Up Restoration Contract ~~contract~~ with NGESO ~~to provide a Restoration Service~~, a condition of that contract requires them to meet the applicable conditions of the Grid Code and therefore they will be required to comply with the obligations of the EU NCER. The Governance of this System Restoration Plan will be managed through GC16 of the Grid Code General Conditions which provides for a governance framework similar to that of the Relevant Electrical Standards.

This System Restoration Plan will be of interest to all parties identified in Appendix A of this document. The obligations on those parties are detailed in the Grid Code and Industry Codes or through contractual arrangements with NGESO rather than this System Restoration Plan which aims to provide a high level overview of the mechanisms available to NGESO to restore the System following a total or partial shutdown. In complying with the requirements of the Grid Code, System Operator Transmission Owner Code (STC), Code and Balancing and Settlement Code (BSC) (as applicable), the National Grid Electricity System Operator (NGESO), Transmission Licensees, Network Operators and CUSC Parties will be satisfying the requirements of EU NCER. It should be noted that the EU NCER applies both to GB Code Users and EU Code Users as defined in Appendix A of this document.

This System Restoration Plan has been developed taking the following into account:

- The behaviour and capabilities of load and generation;
- The specific needs of the high priority SGUs detailed in Appendix B;
- The characteristics of the National Electricity Transmission System and the Network Operator's system; and
- The ability of Restoration ContractorsService Providers (including Black Start Service Providers) to contribute to System Restoration, via a Local Joint Restoration Plan (LJRP) or Distribution Restoration Zone Plan (DRZP).

<sup>2</sup> Article 25 System Operations Guideline

[http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2017.220.01.0001.01.ENG](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.220.01.0001.01.ENG)

For the avoidance of doubt there is a separate document –the System Defence Plan in respect of Defence Service Providers which is available from the following link. ~~(Link to be inserted –currently awaiting approval of GC0148)~~

### 3 System Restoration Plan

#### 3.1 Plan Overview

The EU Network Code on Emergency and Restoration (EU NCER) aims to ensure security and continuity of electricity supply across Europe by creating harmonised standards and procedures to be applied in the Emergency, Blackout and Restoration system state(s). This code requires the development of a System Restoration Plan in advance of such an event specifying measures related to information exchange, operational procedures and post-event analysis.

Although the UK has departed from the EU, the majority of the requirements in the EU NCER have been retained in ~~UKGB~~ law via Statutory Instrument (SI 533 2019). Therefore, unless provided for by exception in SI 533 2019, the requirements of the EU NCER will apply unchanged.

EU NCER sits alongside the Transmission System Operation Guideline<sup>3</sup> (SOGI) which sets out harmonised rules on system operation and identifies different critical system states (Normal State, Alert State, Emergency State, Blackout State and Restoration ~~State~~).

This System Restoration Plan consists of the technical and organisational measures necessary for the restoration of the electricity system in Great Britain from a Partial or Total Shutdown to normal steady state conditions, taking into account the capabilities of the GB parties listed in Table 1 of Appendix A of this document and the operational constraints of the Total System. In addition, NGENO is bound by the requirements of the Electricity System Restoration Standard. This requirement is part of NGENO's Transmission Licence and introduces requirements which aims to ensure that at least 60% of Peak Transmission System Demand is restored in all regions of the GB Synchronous Area within 24 hours of the start of the shutdown and 100% of Peak Transmission System Demand is restored within 5 days.

The main objectives of this System Restoration plan ~~Plan~~ are include:

~~— To satisfy the requirements of the Electricity System Restoration Standard.~~

~~1. To prepare, make available and enact illustrate how Local Joint Restoration Plans (LJRPCs) and Distribution Restoration Zone Plans (DRZPs) can facilitate System Restorations should the need arise.~~

~~1.2.~~ To achieve the Re-Synchronisation of parts of the Total System which have become Out of Synchronism.

~~2.3.~~ To ensure that communication routes and arrangements are available to enable representatives of those parties who fall within the scope of the EU NCER as identified in Appendix A of this System

<sup>3</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1485&from=EN>

Restoration Plan are authorised to make binding decisions on their behalf and to communicate with each other when this System Restoration Plan is active.

~~3.4.~~ To describe the role that in respect of the GB Parties listed in Appendix A may have in the restoration processes as detailed in ~~the relevant De-Synchronised Island Procedures (DIPs) and~~ Local Joint Restoration Plans (LJRPs), ~~Distribution Restoration Zone Plans (DRZPs) and the processes and procedures associated with re-synchronising relevant De-Synchronised Power Islands Procedures (DIPs).~~

~~4.5.~~ To identify and address as far as possible the events and processes necessary to enable the restoration of the Total System in GB to a Normal State, after a Total Shutdown or Partial Shutdown. This is likely to require the following key processes to be implemented, typically, but not necessarily, in the order given below:

- Selectively implement Local Joint Restoration ~~Plans and Distribution Restoration Zone Plans~~;
- Expand Power Islands established through ~~a~~ Local Joint Restoration Plans ~~and Distribution Restoration Zone Plans~~;
- Expand Power Islands to supply ~~non-Restoration Service Providers Black Start Power including but not limited to Power Stations~~ ~~Generators, HVDC System Owners, DC Converter owners and Non-Embedded Customers Plant and Apparatus which do not have an Anchor Restoration Contracts or Top Up Restoration Contracts~~;
- Selectively reconnect demand;
- Expand and merge Power Islands leading to Total System energisation;
- Facilitate and co-ordinate returning the Total System back to normal operation; and
- Resumption of the market arrangements if suspended in accordance with the relevant codes.

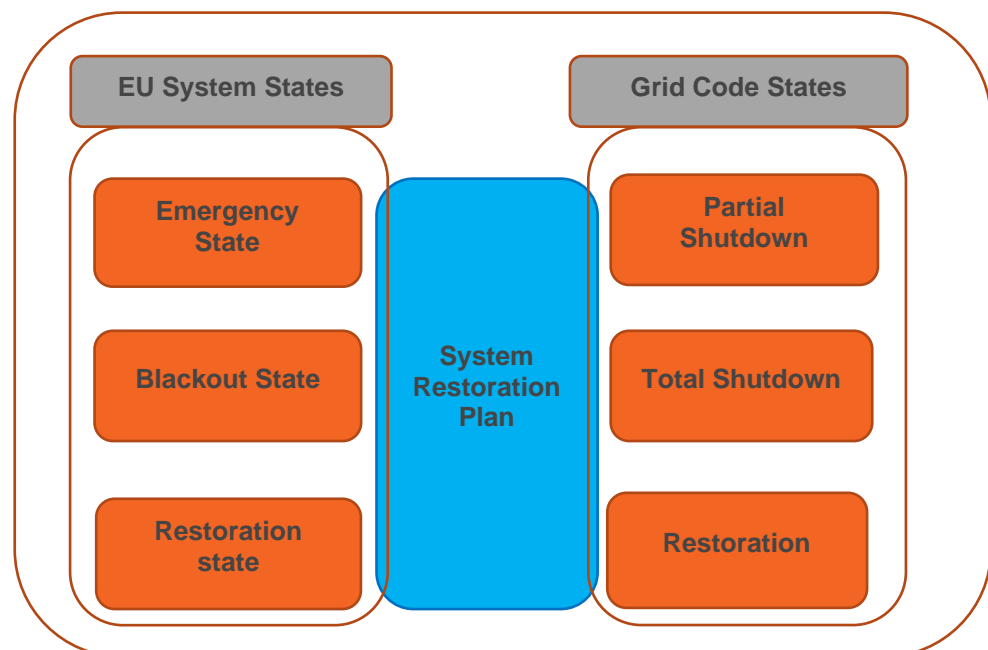
## 3.2 Activation of System Restoration Plan

In Accordance with EU NCER Article 25:

3.2.1 Procedures in this System Restoration Plan can be activated when the System ~~is in an Emergency State and activated procedures of the System Defence Plan have taken place, or will be activated when the or parts of the~~ System ~~are~~ is in ~~at~~ the Blackout State.

3.2.2 Procedures in this System Restoration Plan will be activated by NGESO in coordination with the GB Parties listed in Appendix A of this System Restoration Plan.

- 3.2.3 All instructions issued by NGESO under this System Restoration Plan must be executed by each GB party falling under the scope of the EU NCER (as identified in Appendix A of this System Restoration Plan) without undue delay. It is important to note that for the purposes of this document and the GB Industry Codes, the convention used is that a ~~GB~~ Restoration Service Provider is a “A User or a party with a legal or contractual obligation to provide a service contributing to one or several measures of the System Restoration Plan” whereas a Restoration ContractorService Provider is an “an Anchor Restoration ContractorService Provider or a Top Up Restoration ContractorService Provider” as defined in the Grid Code.
- 3.2.4 NGESO will also manage remedial actions that involve actions from other Transmission Licensees and Externally Interconnected System Operators (EISOs). For Anchor HVDC System Owners and Anchor DC Converter OwnersBlack-Start Service Providers, generally who have plant which is connected to the Transmission system, the requirements of a Local Joint Restoration Plan would apply, though it is possible for an Anchor HVDC System Owner or Anchor DC Converter Owner which has Plant connected to a Network Operator’s System, to be part of a Distribution Restoration Zone Plan-
- 3.2.5 The System Restoration Plan can be activated, and remain active, through the Emergency, Blackout and Restoration states as shown below.



- 3.2.6 Activation of the System Restoration Plan in GB will occur once NGESO determines and informs the Balancing and Settlement



Code Company (BSCCo) through Grid Code OC9.4.6 that either a Total Shutdown or a Partial Shutdown exists and subsequent Black Start instructions are required for System Restoration.

### 3.2.7 Market Suspension (*EU NCER Article 35 part 1*) occurs in GB

- Automatically in the event of a Total Shutdown (in this case the Market Suspension Threshold is not relevant).
- During a Partial Shutdown and in this case the market is only suspended if the Market Suspension Threshold is met. There are three circumstances in which the threshold is met or deemed to be met.
  - NGESO determines that the spot time Initial National Demand Out-Turn is equal to or lower than 95% of the baseline forecast (this means that 5% or more of demand has been lost); or
  - No more baseline forecast data is available to NGESO; or
  - 72 hours have elapsed since the Partial Shutdown commenced.

The conditions under which the Transmission System is deemed to be under an Emergency State and the potential for the Market to then subsequently be suspended are detailed in BC.2.9.8 of the Grid Code.

### 3.2.8 The trigger threshold for the GB System Blackout State shall be maintained as per the current definition of a Partial or a Total System Shutdown as defined in *Grid Code OC9.4.1*.

## 4 System Restoration Plan Procedures

*Grid Code OC9.4* documents the procedure of recovery from a Total or Partial Shutdown. This is based on a top down approach using Local Joint Restoration Plans and a bottom up approach using Distribution Restoration Zone Plans. This allows for a top-down restoration approach (energisation from Black Start Service Providers including other Externally Interconnected System Operators (EISOs)) using Local Joint Restoration Plans. In GB, these processes are detailed in *Grid Code OC9* and *Distribution Code DOC9* and reflect the processes detailed in the EU NCER as follows:

- Re-energisation procedure (*EU NCER Article 26 Section 2*);
- Re-synchronisation procedure (*EU NCER Article 33 Section 4*);
- and
- Frequency management procedure.

### 4.1 Re-energisation procedure

#### 4.1.1 *Grid Code OC9.2* identifies the key processes to be implemented in GB to enable the restoration of the Total System following a Total or Partial Shutdown as:

- Selectively implement Local Joint Restoration Plans and Distribution Restoration Zone Plans;
- Expand Power Islands;
- Selectively reconnect demand;
- Expand and merge Power Islands leading to Total System energisation;
- Facilitate and co-ordinate returning the Total System back to normal operation; and
- Resumption of the Balancing Mechanism if suspended in accordance with the provisions of the Balancing and Settlement Code (BSC).

4.1.2 In order to ~~deliver this restoration, contractual arrangements for Black Start Service Providers are in place as permitted through the Grid Code OCG provisions. enact this plan, the first requirement is to have in place Anchor Restoration Contracts and Top Up Restoration Contracts with a number of Restoration ContractorsService Providers with plant located at strategically located sites. Anchor Restoration ContractorsService Providers are those with plants which can supply power and energise part of the System without any external power supply. Top Up Restoration ContractorsService Providers are those with plants, which upon instruction from NGESO or a Transmission Licensee or a Network Operator in respect of their Top Up Restoration Plant, would generally be issued consequentially after an instruction to an Anchor Restoration Contractor with the Top Up Capability expected to be delivered consecutively after external power supplies had been restored to the Top Up Restoration Contractors sitewhich once supplies have been restored, can be synchronised to the System upon instruction, such that they can deliver the service that the Top Up Restoration Service Provider has agreed to provide. Anchor Plants and Top Up Restoration Plants are used in both Local Joint Restoration Plans and Distribution Restoration Zone Plans. In a Local Joint Restoration Zone Plan, it is required that common practice for an Anchor Plant willto energise parts of the Transmission or Distribution Network in less than 2 hours or less of an instruction from NGESO (as stated in subject to the requirements of the Anchor Restoration Contract) whereas in a Distribution Restoration Zone Plan, it is required that common practice for an Anchor Plant willto energise parts of the Distribution Network in less than 8 hours or less (as stated in subject to the requirements of the Anchor Restoration Contract) of an instruction from the Network Operator.~~

4.1.3 In the case of Local Joint Restoration Plans, ~~t~~The bilateral procurement of **services from parties providing** an Anchor Restoration Contract or Top Up Restoration Contract ~~Black Start service under a Local Joint Restoration Plan~~ is carried out by NGESO. ~~In the case of a Black Start Service Provider where a commercial contract has been established, In the case of Local Joint Restoration Plans,~~ NGESO in coordination with ~~Anchor Restoration ContractorsService Providers, Top Up Restoration Service Providers (as applicable),~~ relevant

Transmission Licensees ~~and~~, Network Operators ~~and CUSC Parties~~ in line with ~~Grid Code OC9.4.7.6, and OC9.4.7.12~~ will ~~develop~~ create a ~~Local Joint~~ Restoration Plan (~~LJP~~) in accordance with ~~Grid Code OC9.4.7.6.1(a) OC9.4.7.7.1.~~

4.1.4 In the case of Distribution Restoration Zone Plans, the ~~trilateral~~ procurement of services from parties providing an Anchor Restoration Contract or Top Up Restoration Contract is carried out by NGESO in coordination with ~~and the relevant Network Operator.~~ In the case of ~~Distribution Restoration Zones,~~ The relevant Network Operator in coordination with NGESO, ~~Anchor Restoration Contractors~~ Service Providers, ~~Top Up Restoration Service Providers (as applicable)~~ and relevant Transmission Licensees (where applicable) will ~~develop~~ create a Distribution Restoration Zone Plan in accordance with ~~Grid Code OC9.4.7.6.1(b) OC9.4.7.7.1.~~

4.1.3 —

4.1.5 Operation of LJRPs are detailed in ~~Grid Code OC9.4.7.7 OC9.4.7.106~~ ~~and OC9.4.7.12.~~ Each individual LJP document provides specific details of how individual ~~Restoration Services- Anchor Plant and Top Up Restoration Plant~~ are to be ~~instructed, and concurrently commence their starting regime in preparation for block loading started and block loaded~~ to create a stable Power Island. In co-ordination with NGESO, these plans provide guidance to Transmission Licensees and Network Operators to assess the status of operational equipment and systems, in a shutdown situation, and identify the organisational and processes necessary to enable an effective restoration. They also identify the split in responsibilities between the relevant Transmission Licensees and relevant Network Operators, together with the appropriate communication channels.

~~Operation of DRZPs are detailed in Grid Code OC9.4.7.8 OC9.4.7.11.~~ Each individual DRZP document provides specific details of how individual Anchor Plant and Top Up Restoration Plant ~~Restoration Services (ie Anchor Plant and Top Up Restoration Plant)~~ are to be ~~instructed, started and concurrently commence their starting regime in preparation for and block loading ed~~ to create a stable Power Island which could be limited to part of a Distribution System or in some cases and where conditions permit, parts of a Distribution System and Transmission System. These plans are prepared by Network Operators and provide guidance to NGESO, ~~Restoration Contractors~~ Service Providers and where relevant, Transmission Licensees to assess the status of operational equipment and systems, in a shutdown situation, and identify the organisational and processes necessary to enable an effective restoration. They also identify the split in responsibilities between relevant Network Operators, NGESO and relevant Transmission Licensees, together with the appropriate communication channels.

4.1.44.1.6 The process for making any changes, amendments or the creation of new LJRP or DRZPs (in the GB Grid Code, LJRP and DRZPs are collectively referred to as a Restoration Plans) are detailed in Grid Code ~~OC9.4.7.6 and OC9.4.7.12~~ OC9.4.7.6.17 together with the arrangements for exercising these plans detailed in Grid Code OC9.4.7.7 and OC9.4.7.8.4.7.8.

4.1.54.1.7 In the case of restoration through an LJRP, voltage and frequency management is overseen by NGESO unless delegated to another party. ~~the relevant Transmission Licensee in accordance with the provisions of the STC 06-1. In Scotland, NGESO directs the relevant Transmission Licensee to expand the network in line with routes identified in the Skeleton Network.~~ In the case of a DRZP, voltage and frequency management is overseen by the relevant Network Operator.

4.1.64.1.8 Once each Power Island is established, they are interconnected with adjacent Power Islands under the direction of NGESO (or relevant Scottish Transmission Licensee as provided for in STCP 06-1) to form larger Power Islands. ~~The Skeleton Network indicates key routes for growing individual Power Islands. Once stable, and having developed a level of circuit security, to enable supplies to be given to further GB parties, other Power Islands~~ and are subsequently interconnected to create a single, synchronous power system.

4.1.74.1.9 During the re-energisation process the resynchronisation and frequency management procedures detailed within this System Restoration Plan are adhered to.

## 4.2 Re-synchronisation procedure

- 4.2.1 EU NCER Article 33 Section 4 requires the appointment of a resynchronisation leader. For the purpose of GB National Electricity Transmission System restoration, NGESO takes on the role of resynchronisation leader, as overall coordinator of the restoration procedure unless alternative arrangements are specified (as currently provided for in Scotland under STCP 06-1, ~~the System Operator Transmission Owner Code Procedure on Black Start~~). Grid Code OC9.5 outlines the requirements for the ~~Re-synchronisation of De-synchronised Power~~ Islands following a Total or Partial Shutdown ~~where Re-Synchronisation of Power Islands takes place following the establishment of Power Islands created under an LJRP or where appropriate and a DRZPs.~~
- 4.2.2 Following any shutdown, the re-energisation procedure requires that several Power Islands are created and expanded with the objective of creating ~~a larger the Skeleton Network~~ ~~Power Island to which can~~ grow to reach available generation and demand. ~~These Power Islands could have been established either through an LJRP or DRZP.~~ The ~~Power Island Skeleton Network~~ is then expanded until all demand, generation and appropriate circuits have been restored. It will, therefore, be necessary to interconnect Power Islands. The complexities and uncertainties of recovery from a Total or Partial Shutdown requires that provisions under this section to be flexible, however, the actions taken when Re-synchronising ~~a De-synchronised Power~~ Islands following any Total Shutdown or Partial Shutdown, may include the following:
- (a) the provision of supplies to appropriate Power Stations to facilitate their synchronisation as soon as practicable;
  - (b) energisation of a skeletal National Electricity Transmission System; and
  - (c) ~~the subsequent strategic restoration of Demand in co-ordination with relevant Network Operators.~~
- 4.2.3 Re-synchronisation of a Power Island is performed by arming and closing a synchronising breaker at the substation joining both Power Islands. The Power System Synchroniser setting is in place to ensure safe closure of the open circuit breaker which is live on both sides. This is designed to synchronise two electrically separate systems which may be running at slightly different frequencies with the two voltages across the open circuit breaker contacts cyclically passing in and out of phase with each other. ~~The requirements for System Synchronising are defined in the Restoration Plans as referred to in Grid Code OC9.4.7.6.3(d)(i)OC9.4.7.9(e)(i). As soon as immediately before following the successful connection of two Power Islands are connected through this process, the Restoration Plan (ie the LJRP or DRZP) shall be terminated as provided for in OC9.4.7.6.3(d)(i).~~



4.2.4 The requirement for the Power System Synchroniser is to ensure the phase angle between voltages is practically zero and the voltage magnitudes and difference in frequency or slip is within pre-set limits. Once the synchronisation command has been executed, the Power System Synchroniser circuit breaker will remain armed for a period of time to allow system conditions to be suitably altered (one frequency driven towards the other by issuing Target Frequency instructions to generators within one power island) to allow the synchronising relay to close the selected circuit breaker. Should the conditions not be met, then the instruction will time out and circuit breaker re-selection and execution of the instruction must be repeated.

4.2.5 The location of Power System Synchroniser circuit breaker facilities on the Transmission System are documented within the relevant Transmission Licensees' internal procedures and are indicated on NGENO's situational awareness displays at the Electricity National Control Centre. Under the Electricity System Restoration Standard, this policy will need to be reviewed for Offshore Transmission Licensees where greater interconnection is expected especially as part of the Holistic Network Design (HND) work.

4.2.6 The setting policy for synchronising relays on the Transmission System is common across all three onshore Transmission Licensees' areas in GB, and are:

- System synchronising slip 0.125Hz;
- System synchronising closing angle 10 degrees;
- Under voltage setting 0.85pu; and
- Voltage difference limit as specified in CC/ECC6.1.4 of the Grid Code.

- 4.2.7 During a Total Shutdown or Partial Shutdown and during the subsequent recovery, the (Transmission) Licence Standards may not apply and the Total System may be operated outside normal Voltage and Frequency standards.
- 4.2.8 In a Total Shutdown and during the subsequent recovery, all instructions issued by **NGESO** (unless specified otherwise) are deemed to be Emergency Instructions under **Grid Code BC2.9.2.2 (iii)** and need not be prefixed with the words "This is an Emergency Instruction".
- 4.2.9 In a Partial Shutdown and during the subsequent recovery, all instructions issued by NGESO to relevant Transmission Licensees **and Network Operators** and relevant GB Parties (as defined in Table A1 of Appendix A of this document) ~~which are part of an invoked LJRP~~ (unless specified otherwise) are deemed to be Emergency Instructions under **Grid Code BC2.9.2.2 (iii)** and need not be prefixed with the words "This is an Emergency Instruction".

### 4.3 Frequency management procedure

- 4.3.1 EU NCER Section 3 Article 29 requires the appointment of a frequency leader during system restoration when a synchronous area is split in several synchronised regions. ~~In GB NGESO takes on the role of frequency leader except in situations where it is delegated to the Transmission Licensee's in Scotland in accordance with STCP-06-1~~
- 4.3.2 Frequency management during system restoration falls into two phases: i) the LJRP/**DRZP** phase and ii) the Skeleton Network phase. NGESO remains the frequency leader in both these phases (except where the role, as currently provided for in Scotland, has been delegated to another Transmission Licensee as defined under STCP-06-1 ~~or Network Operators in the case of DRZPs as provided for in Grid Code OC9.4.7.8.13OC9.4.7.11.16. An exception to this is where NGESO or a Scottish Transmission Licensee has delegated this to another party as part of a Local Joint Restoration Plan or Distribution Restoration Zone Plan.~~
- 4.3.3 Frequency Management during the LJRP **and DRZP** Phases
- ~~In the case of an~~ **During the LJRP and d** **During the LJRP** phase, NGESO will instruct the implementation of required LJRPs. As detailed within the LJRP; demand blocks will be added in line with the requirements of the relevant **GB Party to establish a P-power island**. ~~During this~~ **period when only one GB Party (for example a Power Station or HVDC System Owner) the supply of Active and Reactive Power is provided only by Plant owned and operated by Anchor Restoration ContractorsService Providers and in some cases may also be provided by Plant owned and operated by Top Up Restoration ContractorsService Providers.** During this period, the control of frequency is generally regulated by the Anchor Plant as additional Demand is switched into service. Where Top Up Restoration are involved, there is an increasing coordination role for NGESO which

could be delegated to Scottish Transmission Licensees (as provided for under STCP 06-1) or relevant Network Operators in the case of a Distribution Restoration Zone connected to the Power Island. The frequency is controlled within the LJRP by that GB Party in co-ordination with by NGESO in co-ordination with, relevant Transmission Licensees and/or relevant Network Operators who will also add or remove demand as the GB Party (eg a Generator or HVDC System Owner) requires to maintain Target Frequency.

During this LJRP phase period, an GB Party (such as a Power Station or HVDC System Owner) Anchor Plant Contractors Owner and Top Up Restoration Contractors Service Provider (where required) which are party to the LJRP will be required to regulate their output of their Plant in co-ordination with NGESO and the relevant Transmission Licensee and/or relevant Network Operator to the existing and newly connected demand in the Power Island. NGESO in co-ordination with the relevant Transmission Licensee and/or relevant Network Operator will communicate so that demand and generation are matched to maintain (where practicable) the Target Frequency. Demand will be added to the Power Island as more generation becomes available.

In the case of a DZRP and during the DRZP phase, NGESO will instruct the relevant Network Operator to establish a Distribution Restoration Zone in accordance with the Distribution Restoration Zone Plan. The Network Operator will instruct (either manually or with the aid of a Distribution Restoration Zone Control System) an Anchor Plant to energise part of the Distribution System and start to restore blocks of demand which may also require the use of Top Up Services from other Top Up Restoration Contractors Service Providers. During this phase there is a requirement for relevant Restoration Contractors Service Providers to maintain Target Frequency as detailed within the DRZP. Further demand blocks will be added in line with the requirements of the Distribution Restoration Zone Plan. The relevant Restoration Contractors Service Providers will need to configure their plant, in particular the governor settings so as to aid the growth of the Distribution Restoration Zone.

During this period, a Restoration Contractor Service Provider (eg an Anchor Plant Owner and Top Up service) will be required to regulate their output in co-ordination with the Distribution Network Operator to match the existing and newly connected demand in the Power Island. The relevant Distribution Network Operator will communicate with Restoration Contractors so that demand and generation are matched to maintain (where practicable) the Target Frequency. Demand will be added to the Power Island as more generation becomes available.

#### 4.3.4 Frequency Management during the Power Island Expansion Skeleton Network Phase

In the case of a Power Island formed from an LJRP, the Skeleton Network phase begins when a non Restoration Contractor Service Provider (ie owners and operators of plant other than Anchor

~~Restoration Contractors~~~~Service Providers~~ or a Top Up Restoration ~~Contractors~~~~Service Providers~~ second or subsequent GB Party (as defined in Table A1 of Appendix A) ~~are~~ added to the Power Island. NGESO in coordination with the relevant Transmission Licensees and Network Operators will issue instructions to ~~available~~ Generators, HVDC System Owners ~~and~~, DC Converter ~~Station~~ Owners and Virtual Lead Parties relating to the size of power blocks required to be added or removed from the Power Island to maintain generation stability.

In the case of a Power Island formed from a DRZP, the ~~Skeleton Network~~ subsequent Restoration Phase begins when that Distribution Restoration Zone is connected to another Power Island which has been established through an LJRP or separate adjacent DRZP.

Power Islands will be synchronised to each other using circuit breakers with suitable Power System Synchroniser facilities~~circuit breakers with the frequency of each Power Island being controlled by NGESO in coordination with relevant Transmission Licensees and where appropriate Network Operator~~. Subsequent Power Islands will be synchronised in a similar way. NGESO is responsible for the overall management of System Frequency when Power Islands are connected together to form larger subsystems (ie larger Power Islands).

During this phase, NGESO in coordination with the relevant Transmission Licensee and Network Operators will determine power block size to be added or removed from the Power Island to maintain energy balancing and Power Island frequency. GB Restoration Service Providers~~Parties~~ defined in Table A1 of Appendix A of this System Restoration Plan who are capable of supplying power to the Total System will be instructed by NGESO unless delegated through STCP 06-1. All Power Stations who are instructed by NGESO who resume operation ~~in a Restoration State~~ will remain in Frequency Sensitive Mode until Normal State is achieved or instructed otherwise by NGESO.

## 5. System Restoration to Normal State operation

- 5.1 In GB, ~~a System Black Start R~~estoration will be deemed to be completed according to the rules of the Grid Code and the BSC. In essence, this is as follows:
- If normal market operations have been suspended, then ~~a System Black Start R~~estoration will be deemed to be completed when these operations (including the Balancing Mechanism) have resumed – with this point to be determined by the BSC Panel; or
  - If normal market operations have not been suspended, then ~~a System Black Start R~~estoration will be deemed to be completed when NGESO determines that the Total System has returned to normal operation.

- 5.2 Grid Code ~~OC9.4.7.11~~~~OC9.4.7.14~~<sup>9</sup> describes the considerations to be made by NGESO before declaring that the Total System could return to normal operation:
- the extent to which the National Electricity Transmission System is contiguous and energised;
  - the integrity and stability of the National Electricity Transmission System and its ability to operate in accordance with the (Transmission) Licence Standards;
  - the impact that returning to a Normal State may have on transmission constraints and the corresponding ability to maximise the Demand connected;
  - the volume of Generation or Demand not connected to the Total System; and
  - the functionality of normal communication systems (ie electronic data communication facilities, Control Telephony, etc.)
- 5.3 Once NGESO deems that sufficient confidence in the Transmission System, connected generation and demand and appropriate systems are in place to return to normal operation, it will inform the BSCCo of this development.



## 6. System Restoration Plan Implementation

Article 24 of the EU NCER, provides for the implementation of the System Restoration Plan. In order to implement the System Restoration Plan, NGESO has notified those parties (as identified in Appendix A — ~~GB Restoration Service Providers~~) that in meeting the requirements of the Grid Code (as CUSC Parties or those non-CUSC parties which have ~~Anchor Restoration Contracts or Top-Up Restoration Contracts—contracts with NGESO—to provide Restoration Services~~) that they will be bound by the requirements of the EU NCER.

## 7 Resilience measures to be implemented by the NGESO, Transmission Licensees and Distribution Network Operators<sup>4</sup>

In Accordance with EU NCER Article 11(4):

7.1 NGESO has a list of substations essential for restoration that will be operational in the case of loss of primary power supply for at least 72 hours (EU NCER Article 42) however, due to the sensitivity of this information, it is not possible to share this externally. This information has been shared with the Authority and with the parties who own / operate those substations through the relevant LJRP.

7.2 NGESO, ~~Onshore~~ Transmission Licensees and Network Operators should ensure all plant and apparatus, equipment controlling that plant and apparatus and the necessary personnel with the appropriate skill and knowledge to operate and control that plant and apparatus (for example primary electrical plant, control, protection, metering equipment, computer facilities for the secure operation of the power system) are designed to remain available for use for at least 72 hours in the case of a loss of external power (EU NCER Article 42). This includes any remote data centres required to sustain the critical tools and facilities ~~and is provided for in CC/ECC.7.10 and CC/ECC.7.11.~~

7.3 Critical tools and facilities for NGESO, ~~Onshore~~ Transmission Licensees Network Operators, ~~User's and Restoration ContractorsService Providers~~ taking part in ~~System RestorationBlack Start~~ include ~~but are not limited to:~~ -

i) Tools for operating and monitoring the Transmission System including ~~but not limited to~~ state estimation, the Balancing Mechanism, load and System Frequency control, alarms, real time system operation and operational security analysis including off line transmission analysis.

<sup>4</sup> A DNO would also extend to a Transmission connected iDNO

- ii) The ability to control, protect and monitor transmission assets including switchgear, tap changers and other Transmission System equipment including where available auxiliary equipment and to ensure the safe operation of Plant and Apparatus and the safety of personnel.
- iii) Control Telephony systems as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5 of the *Grid Code*.
- iv) Operational telephony as provided for in STCP 04-5.
- v) Tools and communications systems to facilitate cross border operations.

**In the case of Generators and HVDC System Owners and DC Converter Station Owners**

- i) Tools for monitoring their Plant and Apparatus.
- ii) The ability to control, protect and monitor their Plant and Apparatus including as applicable primary Plant, switchgear, tap changers and other auxiliary equipment and to ensure the safe operation of Plant and personnel.
- iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5 of the *Grid Code*.

**In the case of Network Operators**

- i) Control room Apparatus and tools for monitoring their System including ~~but not limited to:~~ alarms, real time system operation and operational security analysis including off line network analysis.
- ii) The ability to control, protect and monitor those assets necessary ~~during System Restoration for Black Start~~ including switchgear, tap changers and other network equipment including where available auxiliary equipment and to ensure the safe operation of Plant and personnel.
- iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5 of the *Grid Code*.

**In the case of Non-Embedded Customers**

- i) Tools for monitoring their System including but not limited to, alarms and real time system operation.
- ii) The ability to control, protect and monitor those assets necessary for ~~System Restoration~~~~Black–Start~~ including switchgear, tap changers and other network equipment including where available auxiliary equipment and to ensure the safe operation of Plant and personnel.
- iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5 of the *Grid Code*.

7.4 In addition to those listed in 7.3, critical tools and facilities for NGESO will include state estimation applications, facilities for load-frequency control, security analysis and the means to facilitate cross-border market operations.

7.5 NGESO and ~~onshore~~ Transmission Licensees must also ensure they have at least one geographically separate control room with backup

power supplies for at least 72 hours, in case of loss of primary power supply. They must also have a procedure to transfer functions to the Standby Control Room as quickly as possible but in no longer than 3 hours. For Transmission Licensees these provisions are provided for in the STC.

## 8 Assurance & Compliance Testing

EU NCER Article 43 states the general principles for compliance testing. Articles 44 to 49 describe the testing requirements and are summarised below.

- 8.1 In accordance with Article 43(2) of the EU NCER, NGESO has prepared a Test Plan which details how compliance and compliance testing is assessed against the EU NCER.
- 8.2 Each EU Code Generator and GB Code Generator (as defined in the Grid Code) or DC Converter owner or HVDC System Owner and Restoration Contractor shall be required to execute tests to assess their capability at least every 3 years as provided for in Grid Code OC5.7.
- 8.3 In addition to these requirements, section CC.7.11 and ECC.7.11 of the Grid Code includes an Assurance capability assessment. These assurance obligations which are tested through OC5.7.4 and OC5.7.5 are designed at least every three years are to ensure:-
  - Plant can shutdown safely in the event site supplies are lost,
  - The plant can be restarted when site supplies are restored on the basis that supplies are restored within 72 hours of the shutdown
  - Network Operators in coordination with National Grid ESO, Transmission Licensees and other parties have the capability to restore demand at sufficient speed to meet the requirements of the Electricity System Restoration Standard.
- 8.4 Each Generator which owns or operates a Type C or D Power Generating Module shall be capable of delivering a quick re-synchronisation service and shall execute a trip to house load test after any changes of equipment having an impact on its house load operation capability, or after 2 unsuccessful trips in real operation as provided for in Grid Code OC5.7.1(a)(iii) and OC5.7.1(b)(iv).
- 8.5 NGESO, Transmission Licensees, Network Operators and CUSC Parties shall test their communication systems at least every year as provided for in Grid Code CC/ECC.6.5.4.4.
- 8.6 NGESO, Transmission Licensees, Network Operators and CUSC Parties shall test the backup power supplies of their communication systems at least every 5 years as provided for in Grid Code CC/ECC.6.5.4.4.
- 8.7 NGESO and Transmission Licensees shall test the capability of main and backup power sources to supply its main and backup control rooms at least every year.
- 8.8 NGESO and Transmission Licensees shall test the functionality of critical tools and facilities at least every 3 years in accordance with the requirements of OC5.7.4 and OC5.7.5. Where these tools involve CUSC Parties, Restoration Contractors and Network Operators, these

parties shall participate in the tests. Critical tools and facilities are plant and apparatus, equipment controlling that plant and apparatus and the necessary personnel with the appropriate skill and knowledge to operate and control that plant and apparatus.

8.9 NGESO and Transmission Licensees shall test the capability of backup power sources to supply essential services of critical substations at least every 3 years.

8.10 NGESO and Transmission Licensees shall test the transfer procedure for moving from the main control room to the backup control room at least every year. For Transmission Licensees these requirements are provided for in STCP-06-4 (Contingency Arrangements).

8.11 NGESO and User's shall ensure their systems are capable of handling the large volumes of data that would be expected to occur during emergency circumstances such as loss of significant volumes of demand or a System Restoration event.

## **9 Plan Review**

9.1 EU NCER Article 51 requires NGESO to review the measures of the System Restoration Plan using computer simulation tests to assess its effectiveness at least every five years ~~which is provided for under the Assurance work detailed in Grid Code OC5.7.4. Such exercises shall be undertaken at least once every three years. Further tests will be undertaken at least once every years in accordance with OC5.7.5.- Such a process will be documented and developed through internal NGESO business procedures.~~

9.2 The review will cover:

- Simulating the ~~creation of Power Islands~~~~Skeleton Network phase~~ using ~~Restoration Service Providers and GB Restoration Service~~~~Black Start Service Providers~~;
- Demand reconnection process;
- The process for resynchronisation of Power Islands; and
- Learning from operational testing as per the testing procedure

9.3 Operational testing of the System Restoration Plan will be in line with the Assurance and Compliance Testing requirements within the ~~Section 8 of this System Restoration Plan~~~~System Defence Plan as detailed in OC5.7.4 and OC5.7.5 of the Grid Code.~~

9.4 NGESO will review the System Restoration Plan to assess its effectiveness at least every five years ~~although under the Grid Code actual tests and simulations are performed once every three years.-~~

9.5 NGESO will also review the relevant measures of the System Restoration Plan in advance of what NGESO consider to be a

substantial change to the configuration of the National Electricity Transmission System.

- 9.6 —Any substantive changes identified in the review of the System Restoration Plan will be developed through the Governance arrangements in GC16 of the Grid Code General Conditions.



# Appendix A: GB Parties within the scope of the System Restoration Plan

In accordance with EU NCER, Art 2 defines the SGU's who fall within the scope of the European Emergency and Restoration Code. Table A1 defines the EU Criteria and how this translates to which parties within GB (GB-~~Restoration~~ Service Providers) fall within the scope of the EU Emergency and Restoration Code.

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
Existing and new Power Generating modules classified as Type C and D in accordance with the criteria set out in Article 5 of Commission Regulation (EU) 2016/631	New	Any Generator who is an EU Code User who has a CUSC Contract with NGESO and owns or operates a Type C or Type D Power Generating Module	Applicable Grid Code requirements: ECC6.1.2, ECC.6.1.4, ECC.6.2.2.2, ECC.6.3, ECC.6.5, <del>ECC.7.9, ECC.7.10, ECC.7.11</del> , ECC.8, ECC.A.3, ECC.A.4, ECC.A.6, ECC.A.7, ECC.A.8 ECP.A.3, ECP.A.5, ECP.A.6 <del>OC5.4, OC5.5, OC5.7</del> ( <del>OC5.7 will only apply if the provider has a black start contract as applicable</del> ) OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12  BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, Generators with a CUSC Contract who own or operate a Type C or Type D Power Generating Module would meet one or more of the requirements of the System Restoration Plan.
		Any Generator who does not have a CUSC Contract (i.e. Embedded) and owns or operates a Power Station comprising one or more Type C or Type D Power Generating Modules	Not applicable unless that Generator has an <u>Anchor Restoration Contract or Top Up Restoration Contract</u> with NGESO <del>to provide a Restoration Service</del>

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
	Existing	Any Generator who is a GB Code User who has a CUSC Contract with NGESO and owns or operates a Power Station comprising one or more Generating Units or Power Park Modules which i) have a maximum output of greater than 10MW but less than 50MW and connected below 110kV (equivalent to a Type C Power Generating Module) or ii) connected at 110kV or above or has a rated power output of 50MW or above (equivalent to a Type D Power Generating Module)	CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.2.2, CC.6.3, CC.6.5, <del>CC.7.9, CC.7.10, CC.7.11</del> CC.8, CC.A.3, CC.A.4, CC.A.6, CC.A.7 CP.A.3 OC5.4, OC5.5, OC5.7 (as applicable <del>OC5.7 will only apply if the provider has a Black Start contract</del> ), <del>OC5.A.1, OC.5.A.2, OC5.A.3</del> OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, Generators with a CUSC Contract would meet one or more of the requirements of the System Restoration Plan.
		Any Generator who does not have a CUSC Contract and owns or operates a Power Station comprising one or more Generating Units or Power Park Modules which i) have a maximum output of greater than 10MW but less than 50MW and connected below 110kV (equivalent to a Type C Power Generating Module) or ii) connected at 110kV or above or has a rated power output of 50MW or above (equivalent to a Type D Power Generating Module)	Not applicable unless that Generator has an <u>Anchor Restoration Contract or Top Up Restoration</u> - <del>e</del> Contract with NGESO <del>to provide a Restoration Service.</del>

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
Existing and new power generating modules classified as Type B in accordance with the criteria set out in Article 5 of Regulation (EU) 2016/631, where they are identified as SGU's in accordance with Article 11(4)	New	Any Generator who is a EU Code User and has a CUSC Contract with ESO and owns or operates a Type B Power Generating Module	Applicable Grid Code requirements: ECC.6.1.2, ECC.6.1.4, ECC.6.2.2.2, ECC.6.3, ECC.6.4.3, ECC.6.5, <del>ECC.7.9, ECC.7.10, ECC.7.11</del> , ECC.8, ECC.A.3, ECC.A.4, ECC.A.6, ECC.A.7, ECC.A.8 ECP.A.3, ECP.A.5, ECP.A.6 OC5.4, OC5.5, <del>OC5.7</del> (as applicable <del>OC5.7 will only apply if the provider has a Black Start or contract</del> ) OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, Generators with a CUSC Contract who own or operate a Type B Power Generating Module would meet one or more of the requirements of the System Restoration Plan.
		Any Generator who does not have a CUSC Contract and owns or operates a Power Station comprising one or more Type B Power Generating Modules	Not applicable unless that Generator has an <u>Anchor Restoration Contract or Top Up Restoration Contract</u> with NGESO <del>to provide a Restoration Service.</del>

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plant
	Existing	Any Generator who is a GB Code User who has a CUSC Contract with ESO and owns or operates a Power Station comprising one or more Generating Units or Power Park Modules which has a maximum output of greater than 1MW but less than 10MW and connected below 110kV (equivalent to a Type B Power Generating Module)	Applicable Grid Code requirements: CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.2.2, CC.6.3, CC.6.5, <u>CC.7.9, CC.7.10, CC.7.11</u> , CC.8, CC.A.3, CC.A.4, CC.A.6, CC.A.7 CP.A.3 OC5.4, OC5.5, <u>OC5.7</u> ( <u>as applicable</u> <del>OC5.7 will only apply if the provider has a Black Start contract</del> ), OC5.A.1, OC5.A.2, OC5.A.3 OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, Generators with a CUSC Contract would meet one or more of the requirements of the System Restoration Plan.
		Any Generator who does not have a CUSC Contract and owns or operates a Power Station comprising one or more Generating Units or Power Park Modules which have a maximum output of greater than 1MW but less than 10MW and connected below 110kV (equivalent to a Type B Power Generating Module).	Not applicable unless that Generator has an <u>Anchor Restoration Contract or Top Up Restoration C</u> ontract with NGESO <del>to provide a Restoration Service</del>
Existing and new Transmission-	New	Any Non-Embedded Customer who is an EU Code User and who has a CUSC Contract with NGESO. The requirement of the DRSC would also	Applicable Grid Code requirements: ECC6.1.2, ECC.6.1.4, ECC.6.2.3, ECC.6.5, <u>ECC.7.9, ECC.7.10, ECC.7.11</u> ,-

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
connected demand facilities		apply but only when the Demand Response Provider is also a CUSC Party.	<p>DRSC ECP.A.8</p> <p>OC5.4, OC5.5.4 (only in respect of CUSC Parties who are also Demand Response Providers). OC6.8 OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12</p> <p>BC2 (in particular BC.2.9) In satisfying the above Grid Code requirements, Non-Embedded Customers would meet one or more of the requirements of the System Restoration Plan. All Transmission Connected Demand Facilities would have to be BM and CUSC Parties and hence satisfy the requirements of the Emergency and Restoration Code. There is no concept of an Embedded Non-Embedded Customer.</p>
	Existing	Any Non-Embedded Customer who is a GB Code User and has a CUSC Contract with ESO	<p>Applicable Grid Code requirements: CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.3, CC.6.5, <u>CC.7.9</u>, <u>CC.7.10</u>, <u>CC.7.11</u>.</p> <p>OC5.4, OC5.5.4 (only in respect of CUSC Parties who are also Demand Response Providers). OC6.8 OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12</p>

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
			<p>BC2 (in particular BC.2.9)</p> <p>In satisfying the above Grid Code requirements, Non-Embedded Customers would meet one or more of the requirements of the System Restoration Plan.</p> <p>All Transmission Connected Demand Facilities would have to be BM and CUSC Parties and hence satisfy the requirements of the Emergency and Restoration Code. There is no concept of an Embedded Non-Embedded Customer.</p>
Existing and new Transmission Connected Closed Distribution Systems	New	Any Non-Embedded Customer who is an EU Code User and who has a CUSC Contract with <b>NGESO</b>	<p>Applicable Grid Code requirements:  ECC6.1.2, ECC.6.1.4, ECC.6.2.3, ECC.6.5, <u>ECC.7.9</u>, <del>ECC.7.10</del>, <u>ECC.7.11</u>  DRSC  ECP.A.8  OC5.4, OC5.5.4 (only in respect of CUSC Parties who are also Demand Response Providers).  OC6.8  OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only)  OC9  OC10  OC12  BC2 (in particular BC.2.9)  BC3</p> <p>In satisfying the above Grid Code requirements, Non-Embedded Customers (which would include a Closed Distribution System), would meet one or more of the requirements of the System Restoration Plan.</p> <p>All Transmission Connected Closed Distribution Systems would have to be BM and CUSC Parties and hence satisfy the requirements of the Emergency and Restoration Code. There is no concept of a Transmission Connected Non-CUSC Party</p>



EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
	Existing	Any Non-Embedded Customer who is a GB Code User and which has a CUSC Contract with <b>NGESC</b>	<p>Applicable Grid Code requirements:  CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.3, CC.6.5, <u>CC.7.9</u>, <u>CC.7.10</u>, <u>CC.7.11</u>.  OC5.4, OC5.5.4 (only in respect of CUSC Parties who are also Demand Response Providers).  OC6.8  OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only)  OC9  OC10  OC12  BC2 (in particular BC.2.9)  In satisfying the above Grid Code requirements, Non-Embedded Customers would meet one or more of the requirements of the System <b>Restoration Plan</b>.  All Transmission Connected Demand Facilities would have to be BM and CUSC Parties (which would include Closed Distribution Systems) and hence satisfy the requirements of the Emergency and Restoration Code. There is no concept of an Embedded Non-Embedded Customer.</p>

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plant
Providers of redispatching of power generating modules or demand facilities by means of aggregation and providers of active power reserve in accordance with Title 8 of Regulation 2017/1485	New & Existing	BM Participants including Virtual Lead Parties.	ECC/CC 6.5, <del>CC</del> /ECC.7.10/7.11 only DRSC if they are providing Demand Response Services and their equipment was purchased on or after 7 September 2018 and connected to the System on or after 18 August 2019. BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7 (As applicable but biased towards Generator who are registered as Gensets).
Existing and new high voltage direct current (HVDC) Systems and direct current connected Power Park Modules in accordance with the criteria set out in Article 4(1) of commission Regulation (EU) 2016/1447	New	HVDC System Owners and Generators in respect of Transmission DC Converters and/or DC Connected Power Park Modules who are EU Code Users and have a CUSC Contract with NGESO.	Applicable Grid Code requirements: ECC6.1.2, ECC.6.1.4, ECC.6.2.2.2, ECC.6.3, ECC.6.5, <del>ECC.7.9</del> , <del>ECC.7.10</del> , <del>ECC.7.11</del> , ECC.8, ECC.A.3, ECC.A.4, ECC.A.6, ECC.A.7, ECC.A.8 ECP.A.3, ECP.A.7 <del>OC5.4, OC5.5, OC5.7</del> (as applicable <del>OC5.7 will only apply if the provider has a black start contract</del> ) OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, HVDC System Owners with a CUSC Contract who own or operate an

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
			HVDC System. DC Power Park Modules would need to satisfy the same Grid Code requirements as those applicable to new Type C and Type D Power Generating Modules listed in the first row of this table.
		Any HVDC System Owner who does not have a CUSC Contract would not be required to satisfy the requirements of the EU Emergency and Restoration Code.	Not applicable unless that Generator has an Anchor Restoration Contract or Top Up Restoration C-contract with NGESO to provide a Restoration Service
	Existing	DC Converter Station Owners and Generators in respect of Transmission DC Converters who are GB Code Users and have a CUSC Contract with NGESO	Applicable Grid Code requirements: CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.2.2, CC.6.3, CC.6.5, CC.7.9, CC.7.10, CC.7.11 CC.8, CC.A.3, ECC.A.4, CC.A.6, CC.A.7, CC.A.8 CP.A.3 OC5.4, OC5.5, OC5.7 (as applicable OC5.7 will only apply if the provider has a black start contract), OC5.A.4 OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7, In satisfying the above Grid Code requirements, DC Converter Station Owners with a CUSC Contract who own or operate a DC Converter Station would be required to satisfy the requirements of EU NCER. DC Power Park Modules would need to satisfy the same Grid Code requirements as those

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
			applicable to Existing Generators listed in the second row of this table.
Type A and Type B Power Generating Modules referred to in paragraph 3, demand facilities and closed distribution systems providing demand response may fulfil the requirements of this Regulation either directly or indirectly through a third party under the terms and conditions set out in accordance with Article 4(4)	New and Existing	BM Participants including Virtual Lead Parties	ECC.ECC.6.5, <del>ECC.7.9</del> , <del>ECC.7.10</del> , <del>ECC.7.11</del> BC1, BC2, (ECC/CC.6.5 applies only)

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plant
This Regulation shall apply to energy storage units of a SGU, a defence service provider or restoration service provider which can be used to balance the system, provided that they are identified as such in the system defence plans restoration plans or service contract.	New	Any EU Code Generator which has a CUSC Contract with NGESO and which owns and operates Electricity Storage Modules would be classified as a Storage User as defined under the Grid Code.	Applicable Grid Code requirements when acting as a Generator in an exporting mode of operation: ECC6.1.2, ECC.6.1.4, ECC.6.2.2.2, ECC.6.3, ECC.6.5, <del>ECC.7.9, ECC.7.10, ECC.7.11</del> , ECC.8, ECC.A.3, ECC.A.4, ECC.A.6, ECC.A.7 ECP.A.3, ECP.A.5, ECP.A.6 <del>OC5.4, OC5.5, OC5.7</del> (as applicable <del>OC5.7 will only apply if the provider has a Black Start contract</del> ) OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7,
Restoration Service Provider with a <del>legal</del> contract to provide a Restoration service	New	<del>Any Non-CUSC party which has a contract with NGESO is to provide an Anchor Restoration Contract or Top Up Restoration Contract Restoration Service would need to satisfy the appropriate requirements of the Grid Code through a contractual mechanism.</del>	Applicable Grid Code requirements as defined contractually: ECC6.1.2, ECC.6.1.4, ECC.6.2.2.2, ECC.6.3, ECC.6.5, <del>ECC.7.9, ECC.7.10, ECC.7.11</del> , ECC.8, ECC.A.3, ECC.A.4, ECC.A.6, ECC.A.7 ECP.A.3, ECP.A.5, ECP.A.6 <del>OC5.4, OC5.5, OC5.7</del> OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) <del>OC 9</del> OC10 OC12 BC1.4, BC1.5, BC.1.7, BC1.A.1, BC1.A.2.1 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7,

EU Criteria	New or Existing	List of GB Parties ( <del>GB</del> Restoration Service Providers) considered to be SGUs for purposes of the System Restoration Plan (GB SGU's)	Measures of the System Restoration Plan
Restoration Service Provider with a <del>legal</del> contract to provide a Restoration service	Existing	Any Non-CUSC party which is to provide an Anchor Restoration Contract or Top Up Restoration Contract <del>Restoration service</del> would need to satisfy the appropriate requirements of the Grid Code through a contractual mechanism.	Applicable Grid Code requirements as defined contractually: CC6.1.2, CC.6.1.3, CC.6.1.4, CC.6.2.2.2, CC.6.3, CC.6.5, <del>CC.7.9, CC.7.10, CC.7.11</del> CC.8, CC.A.3, CC.A.4, CC.A.6, CC.A.7 CP.A.3 OC5.4, OC5.5, OC5.A.1, OC.5.A.2, OC5.A.3, <del>OC5.7</del> OC.7.4, OC7.6 (OC7.6 - Scotland and Offshore only) OC9 OC10 OC12 BC1.4, BC1.5, BC.1.7, BC1.A.1, BC1.A.2.1 BC2 (in particular BC.2.9) BC3.3, BC3.4, BC3.5, BC.3.6, BC.3.7 <sub>27</sub>

In GB, those parties who fall under the requirements of the EU NCER are defined as GB Restoration Service Providers which are:-

- CUSC Parties; and
- Non-CUSC Parties who are Restoration Contractors who have a contractual agreement with NGESO who are Restoration Service Providers (ie they have an Anchor Restoration Contract or Top-Up Restoration Contract) to provide one or more measures of this System Restoration Plan ; and
- Transmission Licensees whose obligations are defined under the System Operator Transmission Owner Code (STC).
- Transmission Licensees whose obligations are defined under the System Operator Transmission Owner Code (STC).

#### The Connection and Use of System Code.

The Connection and Use of System Code (CUSC) defines the arrangements for parties connecting to or using the Transmission System including but not limited to, issues such as connection, charging, Mandatory Ancillary Services and Balancing Services.

It is a mandatory requirement for any party (such as a Generator, HVDC System Owner, Network Operator, Non-Embedded Customer, Aggregator) which: -

- Is directly connected to the Transmission System;
- Owns or operates a Large Power Station (a Large Power Station is defined in the Grid Code);
- Owns or operates an HVDC System and whose Connection Point is at 110kV or above;
- Owns or operates a DC Converter Station and the Installation has a rating of 50MW or more;
- Applies for Transmission Entry Capacity;
- Is a Licensed Supplier;
- Participates in the Balancing Mechanism; or
- Owns or operates a Large Power Station and that Large Power Station comprises one or more Electricity Storage Modules

To accede to the CUSC and have an agreement with NGESO. A condition of signing the CUSC will necessitate the need for that Party to also meet the applicable requirements of the Grid Code. Any one of these parties (in satisfying the requirements of the Grid Code) will satisfy the requirements of EU NCER and would be treated as a GB Restoration Service Provider..

#### Non-CUSC Parties

A Non-CUSC Party would include one of the following categories, unless that Party has opted to sign the CUSC:

- A Generator who owns or operates a Licence Exempt Embedded Medium Power Station (LEEMPS);



- A Generator who owns or operates an Embedded Small Power Station;
- A Demand Response Provider who may have a commercial contract with **NGESO** to provide Commercial Ancillary Services but has not signed the CUSC;
- A HVDC System Owner who owns and operates an HVDC System and that HVDC System is Embedded and has a Connection Point below 110kV and has not signed the CUSC;
- An DC Converter Station Owner who owns and operates a DC Converter Station and that DC Converter Station is not connected to the Transmission System and has a rating of less than 50MW and has not signed the CUSC; or
- A Generator who owns or operates an Electricity Storage Module and that Electricity Storage Module is part of an Embedded Medium Power Station or Embedded Small Power Station and that Generator has not signed the CUSC.

For the avoidance of doubt, a Non-CUSC Party would not be bound by the requirements of the EU NCER unless that Non-CUSC Party has an Anchor Restoration Contract or Top Up Restoration Contract. ~~contract with NGESO to provide a Restoration Service.~~

# Appendix B: High Priority SGUs & Terms of Re-energisation

Within GB, a High Priority Significant Grid User is classified as:

- A ~~Black Start Anchor Restoration Contractor~~Service Provider or a ~~Top Up Restoration Contractor~~Service Provider;
- A Large Power Station connected directly to the National Electricity Transmission System;
- An Embedded Large Power Station ~~or Restoration Service Provider~~

For the purposes of this Appendix, the terms “Embedded” and “Large Power Station” have the same definition as that defined in the Grid Code.

# Appendix C: List of Transmission Licensees and Distribution Network Operators responsible for Implementing System Restoration Plan Measures

A list of Transmission Licensees, Network Operators are available from Ofgem's website which is available from the following link.

[https://www.ofgem.gov.uk/system/files/docs/2019/08/electricity\\_registered\\_or\\_service\\_addresses\\_new.pdf](https://www.ofgem.gov.uk/system/files/docs/2019/08/electricity_registered_or_service_addresses_new.pdf)

All parties on this list are responsible for ensuring they are able to enact their System Restoration Plan responsibilities.

# Appendix D: Glossary

<del>Anchor DC Converter Owner</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
<del>Anchor HVDC System Owner</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
<del>Anchor Plant</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
<del>Anchor Plant Owner</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
<del>Anchor Restoration Contract</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
<del>Anchor Restoration Contractor Service Provider</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
Balancing Mechanism	As defined in the Glossary and Definitions of the Grid Code.
Balancing Mechanism Participant or BM Participant	As defined in the Glossary and Definitions of the Grid Code.
<del>Black Start Service Provider</del>	<del>As defined in the Glossary and Definitions of the Grid Code.</del>
BEIS	Her Majesty's Government Department for Business, Energy and Industrial Strategy.
CUSC Contract	As defined in the Glossary and Definitions of the Grid Code.
Critical Tools and Facilities	As defined in the Glossary and Definitions of the Grid Code.
Defence Service	A capability as detailed in the System Defence Plan as required from a CUSC Party, as a condition of that party meeting the requirements of the Grid Code or a capability provided by a party which has a contract with NGESO to provide a Defence Service. A Defence Service is one or more capabilities detailed in the System Defence Plan.
Defence Service Provider	As defined in the Glossary and Definitions of the Grid Code.
Distribution Network Operator	Has the same definition as a Network Operator as defined in the Glossary and Definitions of the Grid Code.

<u>Distribution Restoration Zone</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>
<u>Distribution Restoration Zone Control System</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>
<u>Distribution Restoration Zone Plan (DRZP)</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>
<u>Electricity —System Restoration Standard</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>
EU Code User	As defined in the Glossary and Definitions of the Grid Code.
EU Generator	As defined in the Glossary and Definitions of the Grid Code.
European Regulation (EU) 2016/631	Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a Network Code on Requirements of Generators
European Regulation (EU) 2016/1388	Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection
European Regulation (EU) 2016/1447	Commission Regulation (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for Grid Connection of High Voltage Direct Current Systems and Direct Current-connected Power Park Modules
European Regulation (EU) 2017/1485	Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation
European Regulation (EU) 2017/2195	Commission Regulation (EU) 2017/2195 of 17 December 2017 establishing a guideline on electricity balancing
Externally Interconnected System Operator or EISO	As defined in the Glossary and Definitions of the Grid Code.
Frequency Sensitive Mode	As defined in the Glossary and Definitions of the Grid Code.
GB Code User	As defined in the Glossary and Definitions of the Grid Code.
GB Generator	As defined in the Glossary and Definitions of the Grid Code.
<b>GB NETS</b>	<b>Great Britain National Electricity Transmission System</b>
<u>GB Restoration Service Provider</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>

GB Synchronous Area	As defined in the Glossary and Definitions of the Grid Code.
HVDC System	As defined in the Glossary and Definitions of the Grid Code.
Local Joint Restoration Plan	As defined in the Glossary and Definitions of the Grid Code.
National Electricity Transmission System Security and Quality of Supply Standards or NETS SQSS	The National Electricity Transmission System Security and Quality of Supply Standard as published on The National Grid ESO Website:  <a href="https://www.nationalgrideso.com/codes/security-and-quality-supply-standards?code-documents">https://www.nationalgrideso.com/codes/security-and-quality-supply-standards?code-documents</a>
NGESO	The National Electricity Transmission System Operator is responsible for operating the Onshore Transmission System and, where owned by Offshore Transmission Licensees, Offshore Transmission Systems. The <b>NGESO</b> for Great Britain is currently National Grid Electricity System Operator.
Non-Embedded Customer	As defined in the Glossary and Definitions of the Grid Code.
Partial Shutdown	As defined in the Glossary and Definitions of the Grid Code.
Power Generating Module	As defined in the Glossary and Definitions of the Grid Code.
Power Island	As defined in the Glossary and Definitions of the Grid Code.
Power System Synchroniser	Equipment which synchronises two electrically separate synchronous areas together to create one synchronous area.
<del>Restoration Service</del>	<del>A capability as detailed in the System Restoration Plan as required from a CUSC Party, as a condition of that party meeting the requirements of the Grid Code or a capability provided by a party which has a contract with NGESO to provide a Restoration Service. A Restoration Service is one or more capabilities detailed in the System Restoration Plan.</del>
<u>Restoration Contractor</u>	<u>As defined in the Glossary and Definitions of the Grid Code.</u>
<b>Restoration Service Provider</b>	<b>As defined in the Glossary and Definitions of the Grid Code.</b>

<u>Skeleton Network Plan</u>	The detailed restoration plan for restoring a skeletal GB-NETS
System Operator Transmission Owner Code or STC	The System Operator Transmission Owner Code as published on The National Grid ESO Website:  <a href="https://www.nationalgrideso.com/codes/system-operator-transmission-owner-code?code-documents">https://www.nationalgrideso.com/codes/system-operator-transmission-owner-code?code-documents</a>
Target Frequency	As defined in the Glossary and Definitions of the Grid Code.
<u>Top Up Restoration Contract</u>	As defined in the Glossary and Definitions of the Grid Code.
<u>Top Up Restoration Plant</u>	As defined in the Glossary and Definitions of the Grid Code.
<u>Top Up Restoration Contractor Service Provider</u>	As defined in the Glossary and Definitions of the Grid Code.
Total System	As defined in the Glossary and Definitions of the Grid Code.
Total Shutdown	As defined in the Glossary and Definitions of the Grid Code.
TSO	A Transmission System Operator is a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity.
Type C Power Generating Module	As defined in the Glossary and Definitions of the Grid Code.
Type D Power Generating Module	As defined in the Glossary and Definitions of the Grid Code.
Unacceptable Frequency Conditions	As defined in the Terms and Definitions of the Security and Quality of Supply Standard.



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