

# SECONDARY GENERATOR RESTORATION GUIDANCE

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## List of Acronyms

| <b>Acronym</b> | <b>Meaning</b>  |
|----------------|---|
| BEGA           | Bilateral Embedded Generation Agreement                       |
| BELLA          | Bilateral Exemptible Large Licence Exempt Generator Agreement |
| CUSC           | Connection and Use of System Code                             |
| DESNZ          | Department for Energy Security and Net Zero                   |
| DNO            | Distribution Network Operator                                 |
| ENCC           | Electricity National Control Centre                           |
| ESRS           | Electricity System Restoration Standard                       |
| MEL            | Maximum Export Limit  |
| NESO           | National Energy System Operator                               |
| NDZ            | Notice to Deviate from Zero                                   |
| SEL            | Stable Export Limit   |
| TO             | Transmission Owner  |
| TNCC           | Transmission Network Control Centre                           |

## 1. Introduction

The National Energy System Operator (NESO) is an independent public organization at the very heart of Great Britain's energy system. It's dedicated to making sure everyone has access to energy that's not only reliable and clean, but also affordable.

In 2021, the Department for Energy Security and Net Zero (DESNZ), formerly known as the Department of Business, Energy and Industrial Strategy (BEIS) recognized the potential risk of a total system shutdown, a low probability but high-risk event listed in the national risk register because of its significant economic and social impact and responded by introducing the ESRS (Electricity System Restoration Standard).

This standard establishes a legal requirement for the restoration of electricity supplies in the event of an outage on the national electricity system. Under the ESRS, NESO is required, in the event of a total or partial shutdown, to restore 60% of national demand within 24 hours across each of the seven restoration regions, and to restore the 100% total demand within five days, with an implementation date of 31 December 2026.

Successful delivery of the ESRS necessitates the commitment of all stakeholders, as system restoration is a collective responsibility shared among NESO, Transmission Owners (TOs), Distribution Network Operators (DNOs), Generators, and other industry participants.

In accordance with the Grid Code, generators are required to support the system restoration process when instructed by the System Operator during total or partial system shutdown as detailed in OC9.4.7.

This document sets out detailed guidance for preparing secondary generators that are parties to connection and use of system code (CUSC) and subject to the obligations of the Grid Code but do not hold a restoration contract at their sites for system restoration following a total or partial system shutdown.

It draws on current regulatory requirements, technical standards, and operational experience, with the aim of ensuring that all generators are ready to support restoration safely, economically and efficiently under emergency conditions.

In the event of a total or partial shutdown of the Great Britain (GB) electricity system, the Electricity National Control Centre (ENCC) oversees and coordinates the restoration process. In England and Wales, this is done in collaboration with the Transmission Network Control Centre (TNCC), while in Scotland, the ENCC coordinates with Scottish TO's.

Delays, incorrect assumptions, or unrealistic declarations from secondary generators can prolong restoration, destabilise power islands, or lead to trips during synchronisation. In response, the ESRS and associated Grid Code modifications require relevant CUSC Parties to demonstrate restoration readiness through week 24 data submitted under Schedule 16 of the Data Registration Code.

## 1.1 Definitions

**Secondary Generator:** A Generator which has signed the connection and use of system code (CUSC) which is bound by the requirements of the Grid Code, but that generator has no Restoration Contract.

**Restoration Event:** An incident involving a total or partial system shutdown, necessitating coordinated system restoration processes.

**Restoration Contractor:** Parties such as generators, with specific self-start capabilities and obligations as defined within a local joint restoration plan (LJRP) or distribution restoration zone plan (DRZP).

**Bilateral Connection Agreement (BCA):** A CUSC contract which applies between NESO and any directly connected party irrespective of being demand or generation.

**Bilateral Embedded Generation Agreement (BEGA):** A CUSC contract which applies between NESO and any embedded generator who has applied for transmission entry capacity (TEC). Large embedded power stations greater than 100MW must have a BEGA.

**Bilateral Exemptible Large Licence Exempt Generator Agreement (BELLA):** apply only in Scotland and applicable to large embedded power stations under 100MW. BELLA's do not have TEC, and they must meet the requirements of the Grid Code applicable to large generators

**Distribution Restoration Zone Plan (DRZP):** A plan produced and agreed by a network operator, the company, restoration contractors and in certain situations transmission licensees under OC9.4.7.7, detailing the agreed method and procedure by which a network operator will instruct a restoration contractor with an anchor plant to energise, part of a network operator's system within 8 hours of that instruction, and subsequently meet complementary blocks of local demand so as to form a power island. A distribution restoration zone plan may require the use of top up restoration plant.

**Local Joint Restoration Plan (LJRP):** A plan produced and agreed by the company, transmission licensee, restoration contractors and a network operator under OC9.4.7.7, detailing the agreed method and procedure by which the Company or transmission licensee in Scotland will instruct a restoration contractor with an anchor plant to energise, part of the total system within 2 hours of that instruction and subsequently meet complementary blocks of local demand so as to form a power island. A local joint restoration plan may require the use of Top Up Restoration Plant.

**Total Shutdown :** A total shutdown is the situation existing when all generation has ceased and there is no electricity supply from external Interconnections and, therefore, the total system (i.e. Transmission, Distribution and Interconnector infeed into the GB System) has shutdown with the result that it is not possible for the total system to begin to function again without the Company's directions relating to system restoration.

**Partial Shutdown:** The same as a total shutdown except that all generation has ceased in a separate part of the total system and there is no electricity supply from external Interconnections or other parts of the total system to that part of total system and, therefore, that part of the total system is shutdown, with the result that it is not possible for that part of the total system to begin to function again without the company's directions relating to system restoration.

## 1.2 When a Generator has Grid Code obligation and is Deemed a Secondary Generator.

A generator is classified as a secondary generator and therefore subject to the requirements of the Grid Code if any of the following criteria apply:

- The generator owns and/or operates a power station which is directly connected to transmission system (irrespective of being small, medium or large)
- The generator owns and/or operates a large power station (even if embedded)

- The generator owns and /or operates an embedded medium power station and has a BEGA.
- The generator owns and operates plant or aggregated plant (for example a Virtual Lead Party) and is registered as a BM participant

Generators who own and operate small embedded power stations who are BM Participants will be caught by the requirements of CC/ECC6.5, 7.9, 7.10 and 7.11 which includes critical tools and facilities.

### 1.3 Power Station Size

Power station size depends on the power station's registered capacity and the transmission area in which it is connected.

#### Large:

- Large power stations in NGET's transmission area are those with a registered capacity of 100MW and above (irrespective of being directly connected or embedded).
- Large power stations in SPT's transmission area are those with a registered capacity of 30MW and above (irrespective of being directly connected or embedded).
- Large power stations in SHET's transmission area are those with a registered capacity of 10MW and above (irrespective of being directly connected or embedded).

#### Medium:

Medium Power Stations only exist in NGET's transmission area 50 MW or greater but less than 100MW (irrespective of being directly connected or embedded).

#### Small:

- Small power stations in NGET's transmission area are those with a registered capacity less than 50MW (irrespective of being directly connected or embedded).

- Small power stations in SPT's transmission area are those with a registered capacity less than 30MW (irrespective of being directly connected or embedded)
- Small power stations in SHET's transmission area are those with a registered capacity less than 10MW (irrespective of being directly connected or embedded).

#### **1.4 What this Guidance does and does not cover**

##### **This Guidance:**

- Explains existing obligations in practical and operational terms
- Highlights common misunderstandings and noncompliance risks
- Sets out NESO's expectations from secondary generators.

##### **This guidance does not:**

- Introduce new Grid Code obligations or introduce any mandatory requirements to Grid Code Users beyond those of the Grid Code.
- Require secondary generators to have a self-start capability.
- Replace the need to refer to the Grid Code. In case of ambiguity, the Grid Code takes precedence over this guidance document.

## 2 Regulatory and Compliance Framework

Secondary generators are required to comply with all relevant Grid Code provisions for system restoration, including but not limited to, the obligations set out in OC9 (Operational Code 9), which addresses system operation during restoration, and OC5.7, which covers testing and monitoring of performance for restoration purposes. In addition, compliance with CC/ECC7.10 and CC/ECC7.11 is required, ensuring adherence to specific procedures and technical requirements associated with system restoration and coordination during emergency conditions.

These references collectively ensure that secondary generators contribute effectively to the safe and efficient restoration of the electricity system following a total or partial shutdown. Secondary generators are required to be compliant with the applicable parts of DRC schedule 16 and as detailed in PCA.5.7.3, they are required to submit evidence of compliance in their week 24 submissions.

DRC Schedule 16 Part I focuses on generators reasonable restoration cold start times which is different from normal cold start times. DRC Schedule 16 Part II applies only to restoration contractors operating under a DRZP. If you do not hold a restoration contract, this section does not apply to you.

DRC Schedule 16 Part III sets out the assurance activities that each CUSC Party must be compliant with by 31 December 2026 to demonstrate resilience and readiness for restoration.

The following is captured under Schedule 16, Part I and III of the data and registration code and should be submitted to NESO yearly through the week 24 process.

## 2.1 DRC Schedule 16 part 1

**Reasonable restoration cold start time:** The requirement is that assuming a generator was running immediately prior to a total or partial shutdown, and in the event of loss of all external power supplies, the generator should provide the expected time it will take for the first and subsequent BM units to be synchronised after the loss external site supplies have been restored at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours. For clarity, external power supplies refer to electrical supplies provided from outside the generating plant, including TO and DNO networks. For assessment purposes, Generators should assume that supplies to their site be they from the Transmission System, Distribution System or both would be lost.

This requirement reflects restoration conditions where all external supplies may have been unavailable for an extended duration, plant may be operating under degraded conditions, and site access, communications and auxiliary systems may be constrained.

Generators should therefore ensure that declared restoration cold start times are realistic and achievable under restoration conditions, and reflect any operational, environmental, or technical constraints that may affect synchronisation.

Where capability is dependent on specific conditions (e.g. weather conditions for wind generation, or auxiliary systems), these dependencies should be clearly described within the “likely issues” section of the Schedule 16 part 1.

**Likely issues:** Describe any likely issues that would have a significant impact on the time the plant can be synchronised following the loss of site supplies arising as a direct consequence of the inherent design or operational practice of the power station and/or BM Unit, e.g. limited barring facilities, time from a total shutdown or partial shutdown at which batteries would be discharged or the availability of primary fuel supplies.

**Block loading capability:** Block loading capability describes a generating unit’s ability to increase Active Power output from zero to its registered capacity in discrete steps without causing instability, protection operation, or plant trips.

Generators are required to provide an estimate of their block loading capability from 0 MW up to registered capacity, including the size of each incremental loading step, the time interval between steps, and any required hold points between increments.

The declared block loading capability should be valid for operation within a frequency range of 49.5 Hz to 50.5 Hz, in line with DRC schedule 16 requirements. Block loading capability is critical during restoration, as it informs ENCC how generation can be safely added to a power island without destabilising frequency or voltage conditions. Block loading capability may vary depending on generation technology.

For synchronous generators, block loading is typically defined as discrete MW step increases governed by turbine and generator capability. For non-synchronous generators, block loading capability is dependent on available resource (e.g. wind conditions) and control system capability (e.g. PPC). In such cases, block loading may not be suitably represented by discrete MW step changes.

Generators should therefore provide a realistic and conditional representation of their block loading capability. This may include an equivalent run-up (ramp) profile indicating how active power output increases over time, including expected run-up rate (MW/min or equivalent), time to reach key output levels, and any limitations or dependencies (e.g. resource availability or control system constraints).

**Governor setting information required:** From 2025 onwards, Generators, HVDC System Owners and DC Converter owners are required to provide governor setting information in their Week 24 submission in accordance with the applicable requirements of CC.6.3.7(h) and ECC.6.3.7.3.8.

This requirement is intended to provide assurance that, during islanded operation, the generator's frequency control device (or turbine speed governor) does not have unintended implications on the main generating plant, thereby reducing the risk of undesired plant-level control interactions (e.g. between governor, unit load controller and MW setpoint control) and unintended tripping during restoration.

Where a generator does not have a conventional governor (e.g., Power Park Modules and Storage plant such as wind, solar or BESS), the generator should provide the equivalent parameters and description for its power plant controller / power park controller (PPC) or other active power control system.

## 2.2 DRC Schedule 16 part 3

Part 3 assurance activities ensure system resilience and efficient recovery from national power outages, minimising downtime. CUSC parties are required to confirm compliance with the following assurance activities by 31 December 2026.

- **Resilience to a Total or Partial Shutdown for up to 72 hours:** The requirement here is that in an event of a total or partial shutdown, generators plant and equipment must be able to safely shut down without risk to plant or personnel and must be able to remain in a safe state even without external power supplies for up to 72 hours and once external site supplies are restored, it should be capable of restarting within its reasonable restoration cold start times as detailed in CC/ECC7.11
- **Voice Systems Resilience test for minimum 72 hours:** Minimum 72 hours resilience is required under a restoration event. Demonstrated by fulfilling the restoration auxiliary power source test. Generator's voice communication system must remain fully operational for a minimum of 72 hours, even during a complete loss of external power supplies. Most of the generator's control points will have control telephony. This facility is provided by NESO in coordination with the relevant transmission licensees and has a 72-hour resilience capability. Further detail on communication requirements is provided in section 3.
- **Critical Tools and Facilities Control Systems Resilience Demonstration:** Critical Tools and Facilities, as defined under CC/ECC7.10, refer to the tools and facilities required to enable a generator to monitor, control, and protect its plant during a total or partial system shutdown and these should have a minimum of 72 hours resilience following a total or partial shutdown.

The critical tools and facilities requirement detailed in CC/ECC7.10.1 to CC/ECC7.10.3 come under Grid Code modification GC0148 which was

implemented in September 2024 and as such, should already be in place and is not eligible for claim under CMP398. The objective is to ensure that generators can maintain safe plant conditions, retain visibility of their assets, and respond effectively to instructions issued by the ENCC or, where applicable, the relevant TO's in Scotland.

In practical terms, critical tools and facilities include the essential control, monitoring, protection, and communication systems necessary to support safe operation during a restoration event. These include but are not limited to switchgear, tap changers, SCADA systems, alarm, and other auxiliary equipment required to ensure adequate site visibility and control during a restoration event.

NESO does not prescribe the technical solutions to be used. However, generators are expected to demonstrate that appropriate and proportionate measures are in place to deliver the required control, monitoring, protection, and communication capabilities. Examples of critical tools and facilities are provided in Appendix A for guidance and are not exhaustive.

- **Cyber-Security:** Generators subject to the Grid Code should ensure that their critical tools and facilities are cyber secure in line with the network and information systems (NIS) Regulations. Public guidance including the national cyber security centre's cyber assessment framework, sets out good practice expectations for managing cyber security risk, protecting systems, detecting incidents, and supporting response and recovery. Generators should ensure they comply with applicable cyber security requirements and maintain the security and resilience of critical systems to support ongoing operation.
- **Telephony services test:** To ensure that communication infrastructure and applications are maintained to a high standard, an end-to-end confirmation of the voice route should be confirmed by a live test at least once a year.
- **Restoration Procedure review:** CUSC Parties should have internal operational procedures in place so their staff are trained and aware of the

actions they need to take should there be a total loss of supplies at site. Parties should review all relevant restoration related procedures to ensure these are up to date and available should a total or partial shutdown occur. Refer to table 1 below for the restoration control room questions that may be asked during a restoration event.

- **Training:** Actively participate in exercises and training coordinated by NESO.

These assurance activities ensure that generators are well-prepared for a restoration event by strengthening resilience, safeguarding critical systems, and guaranteeing secure, reliable communications.

The 72 hours safe shutdown and restart capability detailed in CC/ECC7.11 ensures that generators can safely shutdown and maintain a safe, operational state without external power for an extended period. This resilience directly supports the restoration process because the ENCC knows, with certainty, that each generator can be contacted and will be ready to respond as soon as external power is restored.

The reasonable restoration cold start times submitted annually under DRC Schedule 16 part 1 provides ENCC with accurate expectations for how quickly each BM unit can synchronize and begin energizing the network after a total or partial shutdown. As a result, recovery plans can be executed efficiently, minimizing delays and uncertainties.

Derogation may be sought where compliance with specific requirements cannot reasonably be achieved. This may arise in a number of circumstances, such as demonstrable technical limitations that make implementation impossible, prohibitive costs associated with the necessary modifications, or situations where the required changes would be disproportionate given the remaining operational life of the generating plant. For example, derogation could be considered if the plant is nearing decommissioning, if original equipment manufacturers (OEMs) are no longer in business and replacement parts or technical support cannot be sourced, or if there are fundamental design constraints that cannot be overcome without extensive and unreasonable expenditure.

It is important that generators follow the established Grid Code derogation process and engage proactively with NESO at an early stage. This approach ensures that all relevant issues are documented and assessed transparently. Generators should provide clear evidence and supporting documentation outlining the barriers to compliance, including technical reports, cost analyses, and details of the plant's operational history and future plans. NESO will review these submissions in detail, considering the broader impact on system security and resilience. Where derogation is granted, it may be subject to specific conditions or time limits, and generators are expected to cooperate fully with any monitoring or mitigation measures required.

### 3 Restoration Process Overview

In the event of a total or partial shutdown, the ENCC and in Scotland, the relevant TO's assumes responsibility for emergency system operations, coordinating the overall response and prioritising the protection of both personnel and assets. Their immediate focus is on stabilising the network to reconnect customers whilst ensuring that safety protocols are rigorously followed throughout all affected sites.

All parties are required to adhere to established shutdown procedures, ensuring that plant and equipment are safely brought offline. This coordinated approach helps to prevent damage, maintain integrity of essential infrastructure, and position each site for an orderly and timely transition into the restoration phase. A list of questions that may be asked to generators during a restoration event is shown in table 1 below. Generators must make sure their staffs are well trained to respond to these questions and requests.

From the generator's perspective, the restoration process is structured into several distinct stages, which may overlap or occur in parallel depending on regional circumstances. Communication between ENCC and in Scotland, the relevant TO's can occur at any stage. These stages provide a clear framework for organised recovery and are designed to align generator actions with ENCC directives, ensuring effective system wide coordination.

#### **Stage 1: System Shutdown and Stabilisation**

When a National Power Outage (NPO) occurs, generators experience a loss of all external supplies. In response, they trip in accordance with their protection and safety systems. The primary goal in this stage is to ensure plant integrity and safety, as detailed in CC/ECC7.11, and to maintain readiness for subsequent restoration steps. The ENCC could in this stage initiate communications with secondary generators to gather key information on plant status, availability, and readiness, as outlined in table 1.

### Stage 2: LJRP and DRZP enactments

Restoration Contractors, pre-selected for their self-start capabilities, are instructed by ENCC to energise isolated sections of the network. These initial islands which are formed through the establishment of Local Joint Restoration Plans (LJRPs) or Distribution Restoration Zone Plans (DRZPs) operate under tight frequency and voltage control, with only essential plant connected to manage risks.

### Stage 3: Communications with secondary generators

Once LJRPs and DRZPs are enacted thereby forming power islands, the balance between load and generation within each island is carefully managed. Generator control rooms confirm visibility and communications, while ENCC assesses the readiness to accept further generation. This stage is critical for ensuring that the system can safely scale up restoration efforts. Effective communication between ENCC and generators is fundamental to safe and timely system restoration.

During a Total or partial shutdown, public communication arrangements cannot be assumed to be available or reliable. Generators must therefore ensure that their control, monitoring, and protection systems remain functional under a restoration event for up to 72 hours as detailed in CC/ECC7.10. Control Telephony (green phone) is the primary resilience voice communication channel between ENCC and generators during restoration events.

NESO in coordination with the relevant transmission licensees provide and maintain a resilient control telephony system up to the generator's control point. The responsibility for communication resilience does not end at the control point. Each generator is required to ensure that all internal communications infrastructure from the NESO provided control point to the relevant operational areas within the site remains robust and functional for at least 72 hours during a total or partial shutdown.

This includes maintaining internal site wiring, backup power supplies, and any cross-site communication links necessary to relay ENCC instructions to all critical assets. Generators whose control points are situated remotely from their plants

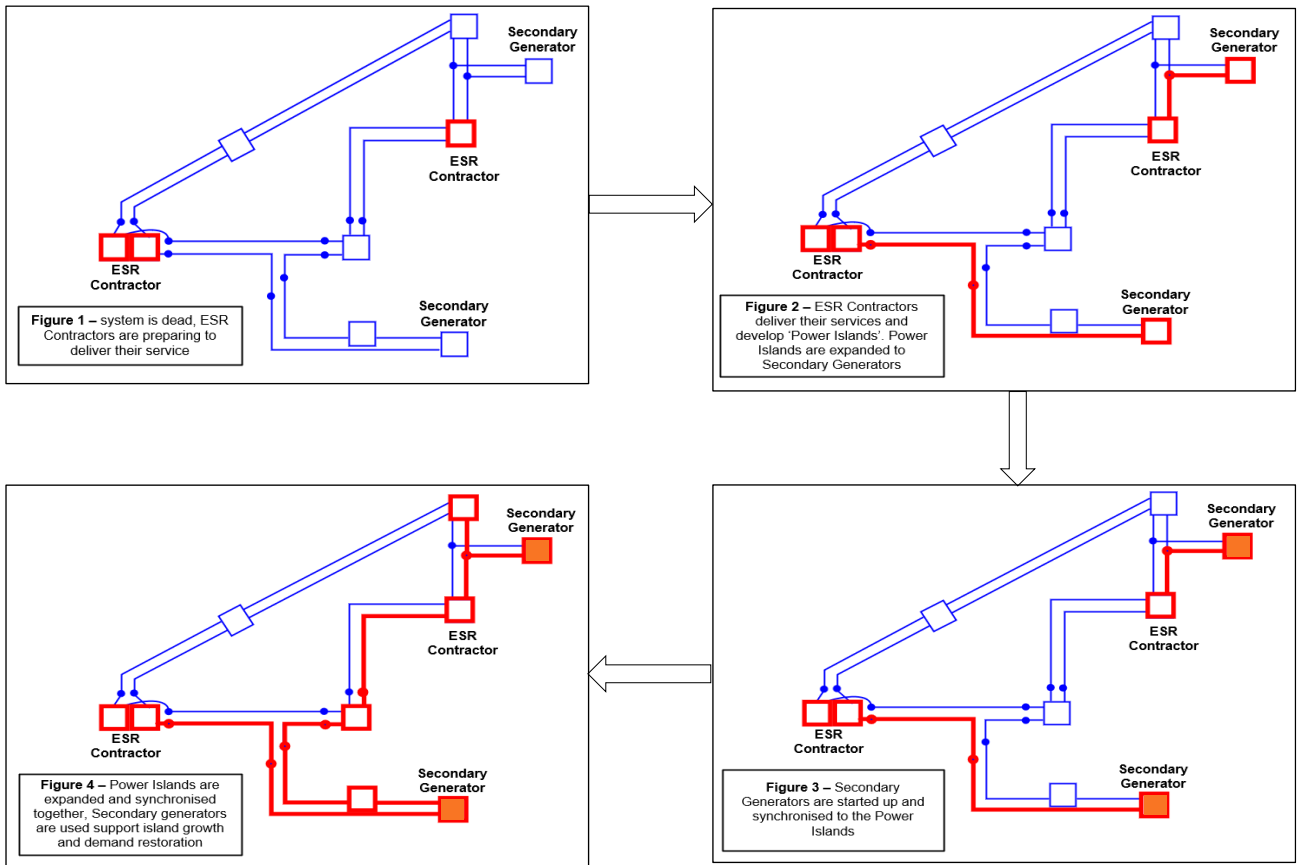
must establish and maintain resilient communications extending beyond the control point to the plant location.

#### **Stage 4: Synchronisation of Secondary Generators**

Secondary generators are contacted and instructed to prepare for synchronisation, which only proceeds when system conditions permit as shown in appendix B. Accurate start-up times and declared capabilities are essential at this point as generators need to connect within their reasonable restoration cold start times, as confirmed in their DRC Schedule 16 part I submission. Generators must not synchronise back to the network during a restoration event unless instructed by the ENCC or in Scotland, by the appropriate TO's.

#### **Stage 5: Expansion and Reintegration**

Islands are gradually expanded and interconnected, with demand systematically restored in phases. Secondary generators may be required to operate flexibly, adapting to evolving system needs. The involvement and preparedness of secondary generators can affect both the timing and resilience of reintegration activities. Schematic 1 below shows an example of the system restoration process.



Schematic I: Restoration procedure

By following this staged approach, generators contribute to a robust and well-aligned restoration process, facilitating efficient coordination with the ENCC and ensuring that the electricity system can be safely and reliably brought back online following a total or partial shutdown.

## 4 Secondary Generator Duties and Expected Actions Before, During and After Restoration Event

The role of Secondary generators spans the entire restoration lifecycle, encompassing preparation prior to an event, operational actions during a total or partial shutdown, and compliance throughout the recovery process as seen in above.

### 4.1 Duties in preparation for Restoration Event

Generators are expected to prepare for restoration before any unlikely event of a total or partial shutdown occurs. This preparation underpins all subsequent actions. At a minimum, generators should ensure that:

1. A comprehensive restoration plan is in place. This plan should set out the necessary procedures and arrangements for responding to a restoration event, ensuring site readiness, clear operational roles, and robust procedures for managing restoration activities in line with ENCC instructions.
2. The Control Point is clearly defined and capable of operating during prolonged outages with 72-hour resilience.
3. Communications systems, including control telephony, are installed, accessible, and tested at least once a year. As NESO progresses toward market restoration, generators must ensure they have the necessary staffing and technical resources in place to resume EDT and EDL updates as soon as these systems are fully operational. This includes maintaining up-to-date operational data and being ready to submit required updates promptly.
4. The minimum staff required during the restoration event with the appropriate authority and competence are identified and available to support restoration activities.

## 4.2 Duties and Expected Actions During a Restoration Event

Following a total or partial shutdown, generators should assume the following conditions until confirmed otherwise:

- External electrical supplies may be unavailable for an extended period.
- Telecommunications and other utilities/services may be degraded.
- Access to site may be restricted.

Generators must therefore allow plant to shut down safely without posing risk to equipment and personnel and they are required to preserve plant integrity, avoiding damage that would delay restart, maintain essential control, monitoring, and communication functions using on-site resilience measures and avoid unauthorised restart attempts or configuration changes. At this stage, generators should not attempt to synchronise unless instructed by ENCC and in Scotland, the relevant TO's

It is important to emphasise that reliance on dispatching staff to site as a solution to meeting the Grid Code requirements is not recommended. During a total or partial shutdown, the feasibility of such actions is significantly hampered, given that essential infrastructure services such as roads, railways, water supply, communications, and sewage etc are likely to be non-operational. Consequently, this may lead to extended restoration times and increased operational challenges.

For those reliant on diesel or alternative fuels for auxiliary power, it is particularly important to adopt a realistic approach to fuel management. This includes having a comprehensive grasp of actual consumption rates under restoration conditions and ensuring sufficient onsite fuel storage for at least 72 hours, as reliance on daily deliveries cannot be guaranteed during a national outage.

In the event of a total or partial shutdown, Generators should refrain from contacting ENCC unless strictly necessary to prevent congestion of communication and diverting resources from restoration activities. ENCC, or in Scotland the relevant TO's acting under delegated authority, will communicate directly with generators and may request confirmation of plant status, availability, and technical capability. Generators should be prepared to respond to the

following type of questions in a timely and accurate manner. These questions are indicative and may vary depending on system conditions and the specific requirements of the restoration process.

| Questions | Description   |
|-----------|---|
| 1         | Following restoration of external supplies, are you able to start up and synchronise to the network?  |
| 2         | How long will it take to start up and synchronise following restoration of supplies (NDZ)?  |
| 3         | Where are your site supplies derived from and What loads are associated with restoring plant supplies?  |
| 4         | Confirm your technical capability for the following parameter: <ul style="list-style-type: none"> <li>• Units Available</li> <li>• Stable export limits (SEL)</li> <li>• Maximum export limit (MEL)</li> <li>• Reactive power capability</li> <li>• Block loading capability</li> </ul> |
| 5         | Do you have any energy storage considerations?  |
| 6         | Confirm if the following operational modes are available: <ul style="list-style-type: none"> <li>• Frequency response</li> <li>• Droop mode</li> </ul>  |
| 7         | Confirm if you have any immediate requirement for external supplies to be restored which will affect the availability of your plant?  |

Table 1: Secondary Generator Data gathering

Generators should ensure that this information is readily available at the control point and that staff are trained to provide responses under restoration conditions. Where full real-time data is not available, generators may provide best-available information or previously declared values together with any known limitations. A sample data gathering template is included in Appendix C, providing an example of the information that may be collected to support assessment of restoration capability.

Following this exchange, and subject to instruction from ENCC or, in Scotland, the relevant TO's, generators may be directed to prepare for and carry out synchronisation. On receipt of such instruction, generators should follow their internal restoration procedures and begin preparatory checks for synchronisation, startup units once external supplies are restored and synchronise to an existing power island when instructed.

Generators should carry out all necessary checks to confirm readiness, communicate any limitations promptly, and avoid unnecessary delays or additional internal approval processes that may impact timely response to instruction as well as avoid introducing last minute configuration changes unless explicitly agreed with ENCC.

During synchronisation, system conditions may be outside normal operating ranges. ENCC may specify timing, loading, or operational constraints. Generators should ensure that block loading and control behaviour align with declared capabilities and should closely monitor plant performance during initial operation.

Once synchronised, generators remain under ENCC or, in Scotland, the relevant TO's direction until restoration is complete. During this period, generators may be required to Hold output steady, vary output to support system stability, operate in frequency-responsive mode and or remain available for further instruction as restoration progresses.

### **4.3 Post Event Review**

Following restoration of the GB network and reinstatement of market operations, generators are recommended to undertake a review of plant performance during the restoration event. This may include consideration of start-up and synchronisation performance, operational challenges or constraints encountered, effectiveness of communication with ENCC or, in Scotland, the relevant TO's and alignment of plant performance with declared capabilities. The outcomes of this review may be used to update restoration procedures and improve future readiness. This process supports continuous improvement and alignment with Schedule 16 assurance activities.

## 5 Appendix A

### Examples of Essential Functions for Restoration

The following table provides illustrative examples of systems and functions that may be used to support compliance with the requirement of critical tools and facilities (CC/ECC.7.10). These examples are provided for guidance only and are not prescriptive or specific requirement. The specific systems and arrangements may vary depending on plant type, size, and configuration. In practice, essential functions may include:

| Critical tools & Facilities | Synchronous Generators           | Description                                     | Wind Generators                   | Description                                 | Solar PV                | Description                       | Battery Storage Systems        | Description                            |
|-----------------------------|----------------------------------|---|-----------------------------------|---|-------------------------|-----------------------------------|--------------------------------|--|
| Control                     | Distributed Control System (DCS) | Centralised unit control and dispatch           | Turbine control system            | Controls rotor, pitch, grid interface       | Inverter control system | Manages power export              | Energy Management System (EMS) | Controls charge/discharge              |
| Protection                  | Generator protection relays      | Overcurrent, differential, frequency protection | Converter protection system       | Protects power electronics                  | Inverter protection     | Protects against faults           | Battery protection system      | Manages thermal / electrical faults    |
| Monitoring                  | SCADA system / CCTV/Alarm        | Real-time plant monitoring / CCTV / Alarm       | SCADA (farm level) / CCTV / Alarm | Central wind farm monitoring / CCTV / Alarm | SCADA / CCTV / Alarms   | Tracks performance / Plant health | Battery monitoring system      | Tracks SOC, temperature / Plant health |
| Communication               | Control Telephony                | Direct communication with ENCC                  | Control telephony                 | Sends data to control centre                | Remote comms            | Data transmission to operator     | EDL / API interface            | Sends real-time data                   |
| Communication               | EDL/EDT                          | Dynamic data exchange                           | Remote comms (VPN / fibre)        | Backup communication                        | Control telephony       | Voice comms                       | Control telephony              | Voice comms with ENCC                  |
| Auxiliary                   | Boiler feed pumps                | Required for steam cycle                        | Turbine yaw/pitch systems         | Align blades and control output             | Inverter auxiliaries    | Supports inverter startup         | HVAC cooling system            | Maintains battery temperature          |
| Auxiliary                   | Lube oil system                  | Protects turbine during rotation                | Auxiliaries                       | Switchgear and control power                |                         |                                   | Inverter system                | Converts DC to AC                      |

Table 2: Examples of Critical tools and facilities

Generators should determine, through a site-specific assessment, the minimum set of systems required to support these functions. Systems that are not required to support control, monitoring, protection, communication or safe operation during restoration may not need to be maintained for the full 72-hour duration. Overall, Critical tools and facilities are required to provide sufficient information of

- plant condition and integrity during loss of site supplies for up to 72 hours and

- confirmation from the Generator of the ability or otherwise of the plant to export power to the Grid once site supplies have been restored.

## 6 Appendix B

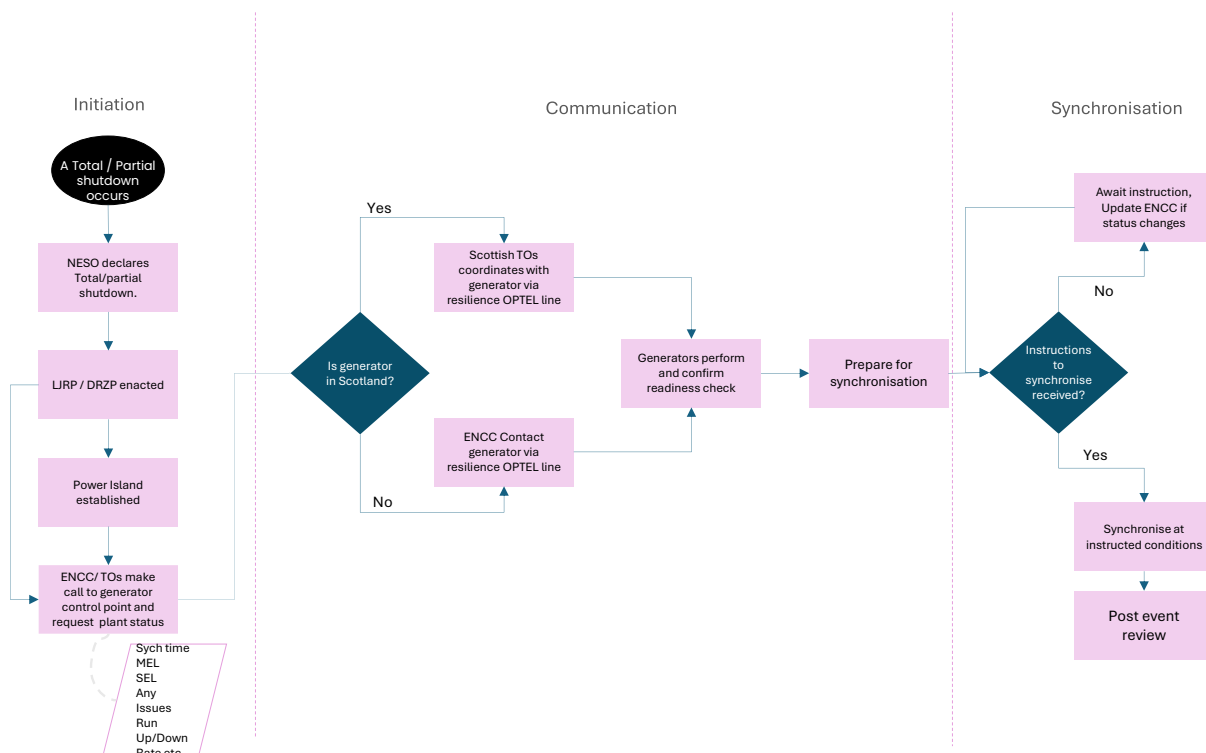


Fig 1: Restoration Flow Chart

This flowchart provides an illustrative overview of the typical communication and coordination process between the ENCC, Scottish TO's, and generators following a total or partial shutdown. It outlines the sequence of actions from initial system restoration through to generator readiness, synchronisation, and post-event review.

## 7 Appendix C

| Regions | Station       | Can station support ESR following restoration of supplies? | Capability (Units, SEL/MEL, Reactive Power, Block Load)                   | Energy Storage available | NDZ (mins) | Droop (D), Frequency Response (FR) available? | Site Supplies and start up requirement             | Other comments                                   | Time Contacted |
|---------|---------------|--|---|--------------------------|------------|---|--|--|----------------|
| A       | Station Alpha | Yes (once external supply is available)                    | Units -1<br>SEL- 100MW<br>MEL -220MW<br>RP±180 MVar<br>Block load - 60MW  | N/A                      | 120mins    | D - Y/N<br>FR - Y/N                           | Auxiliary supplies required from 132KV network     | N/A  | 10:30          |
| B       | Station Beta  | Yes (once external supply is available)                    | Units -2<br>SEL- 150MW<br>MEL - 300MW<br>RP±120 MVar<br>Block load - 40MW | Battery - 20MWh          | 90mins     | D - Y<br>FR - Y                               | Start depends on availability of external supplies | N/A  | 11:15          |
| C       | Station Gamma | Yes (once external supply is available)                    | Units -3<br>SEL- 80MW<br>MEL -200MW<br>RP±100 MVar<br>Block load - 30MW   | N/A                      | 60mins     | D - Y<br>FR - N                               | Auxiliary transformer energised from grid          | Limited ramp capability during initial operation | 14:45          |

Table 3: Generator Data Gathering

The table 3 above provides an illustrative example of how secondary generator availability information may be captured during initial restoration checks.