

Publicly Available

Restoration Technical Requirements and Specification

Disclaimer

Information that is supplied in this document as part of this EOI Pack is supplied in good faith. The information contained in the Long-term 2029 EOI Pack and in any related written or oral communication is believed to be correct at the time of issue, but National Energy System Operator (NESO) will not accept any liability for its accuracy, adequacy or completeness and no warranty is given as such. Any reliance by a Tenderer or any third party on the information provided by NESO as part of this EOI Pack is at the Tenderer's and/or third party's risk.

Version Control

| Version number | Date | Notes |
|----------------|---------------|---|
| V1 | 24 March 2025 | Initial version published at EOI. Please note this document may be updated at ITT stage following market feedback and/or learnings in-between EOI and ITT stages of the tender process. |

Introduction

This technical specification is made up of the follow parts:

- Part 1 – Regions of Needs
- Part 3 – Restoration Specific Eligibility Criteria
- Part 2 – Restoration Service Specification

Publicly Available

Part 1 – Regions of Need

NESO are seeking any proposals that contribute towards meeting the Electricity System Restoration (ESR) standard across Great Britain. Any proposals received will be considered by NESO in line with the published assessment methodology.

Part 2 – Restoration Specific Eligibility Criteria

- New/Additional Capability
 - Solutions must be either: new, providing additional capability through incremental investment,
 - A new solution is:
 - Any solution with a new connection offer or connection agreement received after 30/09/2024 or;
 - Anything registered on TEC after 30/09/2024
 - A solution providing additional capability through incremental investment is:
 - Anything with a connection agreement in place prior to 30/09/2024 or on TEC register prior to 30/09/2024 but following 30/09/2024 is:
 - Making a modification to install additional restoration capability beyond any existing capability
- Solutions must meet the relevant Grid Forming requirements for either GBGF-I or GBGF-S in ECC.6.3.19.

Part 3 – Restoration Service Specifications

3.1 Availability

This tender is seeking solutions to be available for 80% of Settlement Periods.

3.2 Sizing and Number of Solutions

All minimum size requirements are listed within Section 3.3 and 3.4 below.

3.3 Technical requirements - Primary Restoration Service Providers

A potential Primary Restoration Service Provider must be able to provide all minimum technical requirements listed below under the relevant section. The potential Primary Restoration Service Provider may achieve this through adaptations proposed in the Feasibility Study, or by contracting with other parties if they cannot meet all of the below themselves. The Primary Restoration Service Provider must be able to meet the technical requirements at one point of connection.

| Requirement | Minimum | Definition | Rationale |
|------------------------|----------|--|---|
| Time to Connect | ≤ 2hours | Time taken to start-up the Restoration Station from shutdown without the use of external power supplies, and to energise part of the NETS, within two hours of | As per the Grid Code requirement (OC9.4.5.1) ² . |

Publicly Available

| | | | |
|--|--------------|--|--|
| | | receiving an instruction from the Electricity System Operator (ESO) or its delegate. | |
| Or Phase 2 Time to Connect | 2 - 24hours | Time taken to start-up the Restoration Station from shutdown without the use of external power supplies, and to energise part of the Network, within 2-24hours of receiving an instruction from the Electricity System Operator (ESO) or its delegate. | Primary Restoration Service Providers with the ability to re-start and contribute to Restoration. |
| Or Phase 3 Time to Connect | 24 - 72hours | Time taken to start-up the Restoration Station from shutdown without the use of external power supplies, and to energise part of the Network, within 24-72hours of receiving an instruction from the Electricity System Operator (ESO) or its delegate. | Primary Restoration Service Providers with the ability to re-start and contribute to Restoration. |
| Service Availability | ≥ 80% | The ability to deliver the contracted Restoration Service over 80% of a year. Note: It is the responsibility of the Provider to demonstrate its service availability. By submitting a tender, the provider commits to ensuring availability at least 80% of each year of the service. | Primary Restoration Service Providers are expected to have a high restoration service availability so that they can be relied upon in the instance of a Total or Partial shutdown, which could happen at any time. |
| Voltage Regulation | Existent | Ability to create a voltage source and remain connected within acceptable limits during energisation/block loading ($\pm 10\%$). | During events such as load pick-ups, Primary RSPs will need to maintain voltage (within limits) when creating, maintaining, and expanding a power island following instructions from the ESO. |
| Frequency Regulation | Existent | Ability to manage frequency level when block loading (47.5Hz – 52Hz). | During a restoration event, a Primary RSP will need to maintain frequency within limits when creating, maintaining, and expanding a power island following instructions from the ESO. |
| Resilience of Supply, Restoration Service | ≥ 10hours | When instructed, the minimum time the RSP will deliver the contracted service. | To support restoration of the NETS. |
| Resilience of Supply, Restoration Auxiliary Unit(s) | ≥ 72hours | Run continuously at the output required to support / deliver the contracted restoration Service | The ESO or it's delegate would not instruct all Primary RSPs at the same time therefore this is to allow for Primary RSPs to remain ready and instruct able anytime within the resilience period. |

Publicly Available

| | | | |
|--|---|--|---|
| Block Loading Size | $\geq 10\text{MW}$ | Capability to accept loading of demand blocks continuously during contracted service time. | The restoration approach for GB going forward will be a combination of top-down approach and bottom-up approach. The Primary RSP must be able to match the DNO's ability to segregate and switch the Distribution Network remotely. |
| Contracted Active Power | $\geq 50\text{MW}$ | Minimum capability to provide active power continuously. | To support local demand restoration |
| Reactive Capability | $\geq 50\text{MVA}_r$ Leading | Ability to continuously energise part of the NETS, managing Voltage with Leading or lagging capability whilst active power is zero. | Primary RSPs must be able to re-energise parts of the National Electricity Transmission System (NETS), with no load. The higher the reactive capability of a provider, the more quickly access to demand can be achieved. |
| Sequential Restoration attempts | ≥ 3 | Ability to perform at least three sequential start-ups after a failure at any stage of start-up. | To allow for possible tripping of the NETS during the re-instatement period, or trips during the Primary RSP's own starting sequence. |
| Short-circuit level (SCL) (following the start of a system disturbance) | For $t \leq 80\text{ms}$: $I \geq \frac{240 [\text{MVA}]}{\sqrt{3} \cdot U} [\text{kA}]$ For $t > 80\text{ms}$: $I \geq \frac{100 [\text{MVA}]}{\sqrt{3} \cdot U} [\text{kA}]$ $U \equiv$ connection voltage [kV] | Remain the continuous capability of Injection of reactive current during a disturbance. | The higher the SCL, the quicker Power Islands are developed. This requirement can be demonstrated from Fault Ride Through test evidence, or via appropriate simulation. |
| Inertia Value | $\geq 400 \text{ MVA.s}$ | Stored energy available in the RSP for immediate release in response to changes in power levels and thereby helping to maintain frequency and voltage on the power island within acceptable bounds. (This inertia can be provided through GBGF-S, or GBGF-I plant). The service is required to be continuous during contracted service time. | If more Inertia is provided, larger active power imbalances may be managed across re-energisation, enabling larger demand blocks and generation that is not synchronous to be restored earlier than would otherwise be possible. |

3.4 Technical requirements - Top-up Restoration Service Providers

A potential Provider of a Top-up Service for Restoration must be able to provide all the Mandatory Requirements (Resilience, Availability, Frequency Regulation and Voltage Regulation) and at least one of the others listed below. The potential Provider of a Top-up service for Restoration may

Publicly Available

achieve this through adaptations evidenced by their Feasibility Study, or by contracting with other parties if they cannot meet all of the above themselves.

Mandatory Requirements

| Requirement | Minimum | Definition | Rationale |
|--|-----------|--|---|
| Resilience | ≥ 72h | Ability to maintain a state of readiness that will enable the Restoration Service Provider, once external electrical supplies are re-established, to receive an instruction from the ESO and Start-Up in alignment with the expected behaviour under normal operating conditions. | Increase likelihood of availability/readiness of generation to support Restoration. |
| Resilience of Supply, Restoration Service | ≥ 10hours | When instructed, the minimum time the RSP will deliver the contracted service. | To support restoration of the NETS. |
| Service Availability | ≥ 80% | The ability to deliver the contracted Restoration Service over 80% of a year. Note: It is the responsibility of the Provider to demonstrate its service availability. By submitting a tender, the provider commits to ensuring availability at least 80% of each year of the service. | Aligned with Primary RSPs, Providers expected to have a high availability so that they can be relied upon in the instance of a Total or Partial shutdown, which could happen at any time. |
| Voltage Regulation | Existent | Ability to manage voltage and remain connected within acceptable limits during energisation/block loading | Grid Code CC.6 / Grid Voltage Variations |
| Frequency Regulation- | Existent | Ability to manage frequency and remain connected within acceptable limits during energisation/block loading. | Grid Code CC.6 / Grid Frequency Variations |

At least one of the Requirements below

| Requirement | Minimum | Definition | Rationale |
|---------------------------|---------|---|--|
| Block Loading Size | ≥ 10MW | Capability to accept instantaneous loading of demand blocks continuously for the contracted restoration service time. | The restoration approach for GB going forward will be a combination of top-down approach and bottom-up approach. The Primary RSP must be able to match the DNO's ability to segregate and switch |

Publicly Available

| | | | |
|--|--|--|--|
| | | | the Distribution Network remotely. |
| Reactive Capability | ≥ 50MVAR Leading | Ability to energise part of the NETS, managing Voltage with Leading or lagging capability whilst active power is zero. The service is continuous during contracted service time. | Primary RSPs must be able to re-energise parts of the National Electricity Transmission System (NETS), with no load. The higher the reactive capability of a provider, the more quickly access to demand can be achieved. |
| Short-circuit level (SCL) (following the start of a system disturbance) | <p>For $t \leq 80\text{ms}$:</p> $I \geq \frac{240 [\text{MVA}]}{\sqrt{3} \cdot U} [\text{kA}]$ <p>For $t > 80\text{ms}$:</p> $I \geq \frac{100 [\text{MVA}]}{\sqrt{3} \cdot U} [\text{kA}]$ <p>$U \equiv$ connection voltage [kV]</p> | Injection of reactive current during a disturbance. The service is continuous during contracted service time. | <p>The higher the SCL, the quicker Power Islands are developed.</p> <p>This requirement can be demonstrated from Fault Ride Through test evidence, or via appropriate simulation.</p> |
| Inertia Value | ≥400 MVA.s | Stored energy available in the RSP for immediate release in response to changes in power levels and thereby helping to maintain frequency and voltage on the power island within acceptable bounds. (This inertia can be provided through GBGF-S, or GBGF-I plant). The service is required to be continuous during contracted service time. | If more Inertia is provided, larger active power imbalances may be managed across re-energisation, enabling larger demand blocks and generation that is not synchronous to be restored earlier than would otherwise be possible. |

Publicly Available

3.5 Operational Metering Requirements

Providers will be required to provide operational metering if successful and offered a restoration contract. As a minimum the NESO Control Room will require a live feed showing:

- Frequency (Hz)
- Voltage (kV)
- Availability of Contracted Units (for each contracted Unit, Available/Unavailable)
- Power Output – MW
- Power Output – MVAR

Specifically for Wind Providers we are also expecting the additional information:

- Wind speed forecasts and observations (ms^{-1})
- Wind direction forecasts and observations (degrees)

3.6 ESR Communication Lines

All providers who are awarded a tender through this competitive procurement event are responsible for ensuring that the ESR telephone/comms line is always working effectively during the contract. It is the providers responsibility to test this at regular intervals in line with the tender terms.

3.7 Commissioning Test Requirements

Providers who are awarded a contract, must make necessary arrangements for a Commissioning Assessment test before the service can go-live. Requirements for this test are stated within the following published document “LT29 ESR Operational Metering Commissioning Assessment and Testing Guidance V4.pdf”.