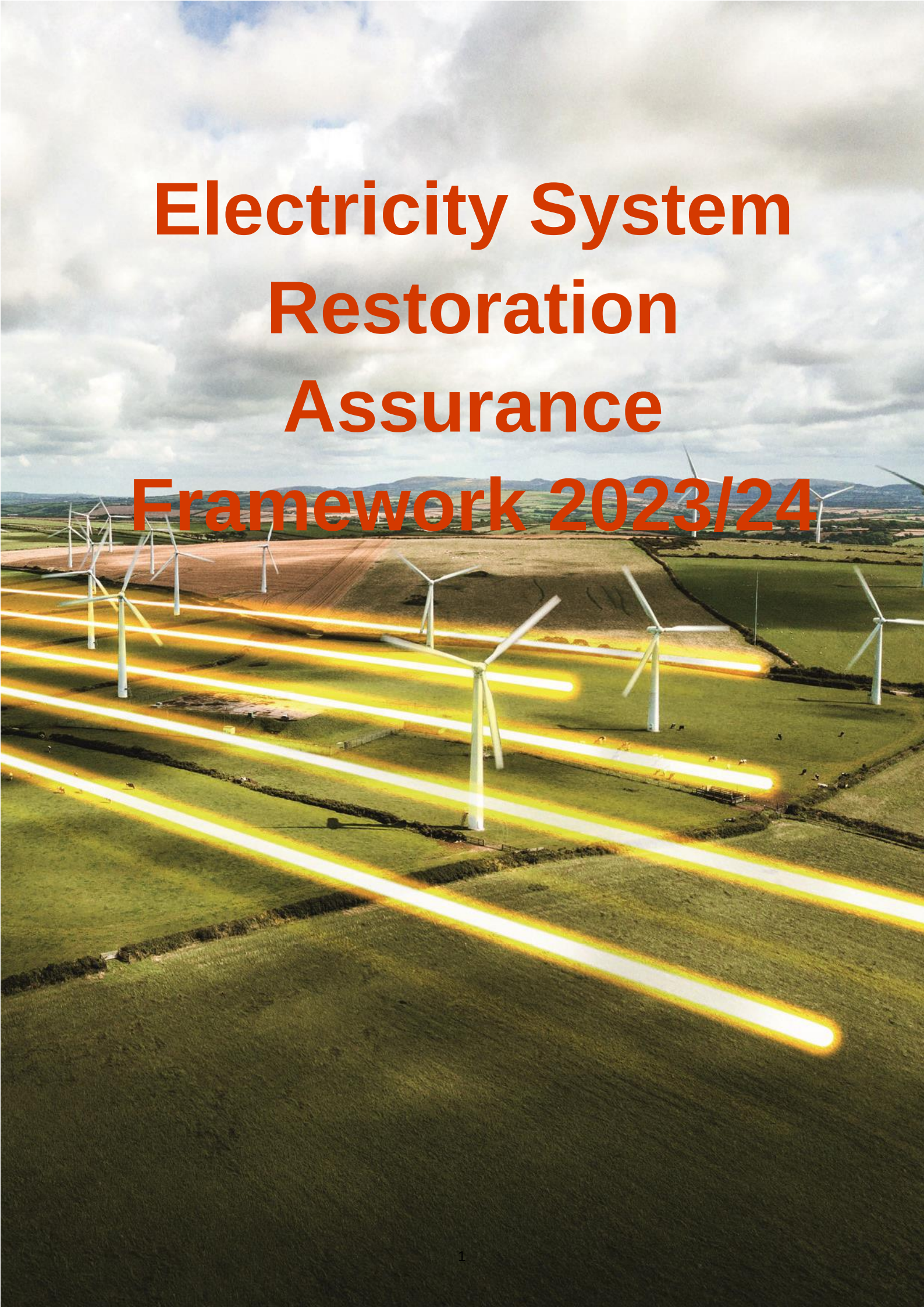
Electricity System Restoration Assurance Framework 2023/24



ESO

Executive Summary

The Electricity System Restoration Standard (ESRS) prescribes new restoration targets effective 31st December 2026, for the Electricity System Operator (ESO) to have sufficient capability in place, in the event of a Total System Shutdown, to restore:

- 60% of National Demand being restored within 24 hours in all regions[1] and
- 100% of National Demand being restored within 5 days nationally.

The ESO is also obligated under the ESRS to submit an Assurance Framework demonstrating how the ESO will comply with the ESRS to the Office of Gas and Electricity Markets (OFGEM) for approval annually. This is the Assurance Framework for 2023 and it is the second report since BEIS[2]'s directive in 2021.

The strategy currently adopted by the ESO to restore the National Electricity Transmission System (NETS) is to utilise contracted Restoration Contractors (RCs) in pre-agreed Local Joint Restoration Plans (LJRPs) to start the formation of power islands. Other generators powered by the RCs join the process resulting in the formation of larger more stable Power Islands. Adjoining power islands are synchronised to rebuild the Grid. The latest modelling results from our Monte Carlo simulation-based tool indicate that in 2023 this approach would take on average 32.1 hours to restore 60% of National Demand, as shown in Figure 1.

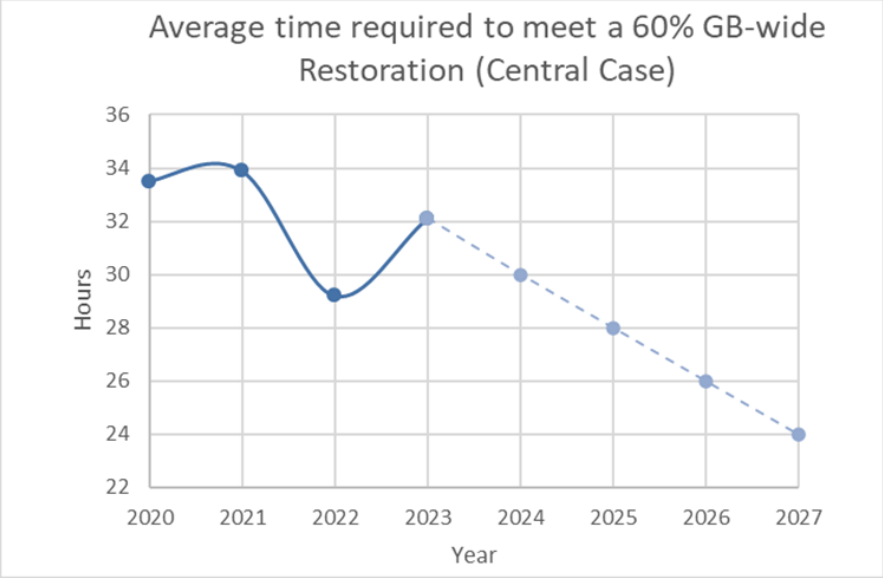


Figure 1-Probabilistic tool modelling results of restoration time

The ESO acknowledges the volume of work required to be done to achieve the ESRS target of restoring 60% of National Demand within 24 hours following a Total System Shutdown. To do this the

[1] North Scotland, South Scotland, North East, North West, Midlands, South East and South East
[2] BEIS is now referred to as Department for Energy Security and Net-Zero (DESNZ).

ESO is proposing a holistic Restoration Approach that takes into account the findings from the Distributed ReStart project. The Restoration Approach to be adopted includes:

- Assimilating outputs from the Distributed ReStart project into the Restoration Service Tenders
- Making changes to relevant Industry Code to reinforce our ability to Restore the System which is based on the solutions developed through Grid Code Modification GC0137 and being developed through Grid Code modification (GC0148)
- Contracting new Restoration Contractors
- Updates to Regulatory Frameworks (Grid Code, STC, CUSC, BSC)
- Development of a Restoration Decision Support Tool (RDST) to support control engineers
- The inclusion of Offshore Generation in the Restoration process
- Compliance monitoring and training

We anticipate that there may be certain risks which could affect the successful deployment of the new Restoration Approach. The key risks have been identified and categorised under organisational risks, compliance monitoring risks, market risks and regulatory risks. The ESO will continuously monitor these risks and propose adequate measures to mitigate them.

Introduction

Electricity System Restoration (ESR) is the procedure to recover from a Partial or Total Shutdown of the NETS, which has caused an extensive loss of supply. The ESO has Grid Code obligations (CC6.3.5 and ECC 6.3.5) to, at any times, be able to restore the NETS in the event of a Partial or Total Shutdown within the stipulated timeframes. A Total Shutdown in Great Britain is categorised as a High Impact, Low Probability (HILP) risk, because even though it is unlikely for it to occur, the impact when such an event occurs will be significantly detrimental to the economy and society in general.

The Department for Business, Energy, and Industrial Strategy (BEIS) aiming to mitigate this risk issued a directive to the ESO, known as Electricity System Restoration Standard (ESRS), in 2021. The ESRS will require the ESO to have the capability and arrangements in place to restore 100% of Great Britain's National Demand within 5 days, with an interim target of re-energising 60% of National Demand within 24 hours. The ESO is required to be fully compliant to ESRS no later than 31 December 2026.

Special Condition 2.2.1 directs the ESO to also produce an ESR Assurance Framework demonstrating the strategy the ESO has adopted to ensure compliance with the ESRS. This document presents the Assurance Framework for 2023/24 and includes, but is not limited to the following:

- The current restoration strategy utilised by the ESO,
- The proposed holistic restoration strategy, including the recommendations from the Distributed ReStart Project,
- The progress made in implementing the strategy and next steps,
- The risks and mitigations to the proposed strategy,
- Modelling results and interpretation.

Vision

The vision of the ESO is set out by our RIIO-2 Business Plan 2, April 2023 - April 2025 (published on 30 August 2022) and includes but not limited to:

- Develop new, competitive market services to support operational needs.
- Maintain legacy systems, develop new systems and tools to future-proof the Control Centre.
- Deliver requirements of the new Electricity System Restoration Standard (ESRS).
- Lead deeper and quicker reform of codes/regulatory frameworks.
- Build on our system insights.
- Improve visibility of DER and focus on whole electricity system coordination.
- Develop networks fit for the future and improve network access.

The ESO is committed to implementing the ESRS by 31st December 2026 and is committed to investing in activities that will lead, organise and build consensus with Government, Regulator and the industry to drive improvements to system restoration capability.

Progress to date

The ESO has made some significant progress towards implementing the ESRS and the recommendations from the Distributed ReStart project. We have raised modification requests to change various aspects of the Regulatory Frameworks including Grid Code, the System Operator Transmission Owner Code (STC), Connection and Use of System Code (CUSC), Balancing Settlement Code (BSC) and Security and Quality of Supply Standard (SQSS) to include the new requirements that will facilitate the implementation of the ESRS by December 2026.

The ESO aims to complete all code modification processes by the third quarter of 2023, which should allow sufficient time for all affected parties to act on their new requirements in time for the 2026 deadline. The progress made in areas such as stakeholder engagements, Distributed ReStart project, wind as RCs, industry codes amendments, competitive tendering and the development of the Restoration Decision Support Tool are discussed in this section.

Stakeholder Engagement

In November 2021, seven non-code working groups (WG) made up of industry stakeholders were formed to identify the requirements for the ESRS. These working groups were the Technologies and Locational Diversity WG, Future Networks WG, Markets and Funding Mechanism WG, Regulatory Frameworks WG, Assurance WG, Communications Infrastructure WG, and Modelling & Restoration Tool WG. The working groups made several proposals towards the implementation of the ESRS. All the working groups were dissolved in March 2022.

- The Technologies and Locational Diversity WG proposed a minimum of three technologies Restoration Contractors (RCs) per Distribution Network Operator (DNO) licenced area to allow for redundancy and uniform restoration across all regions, except for UK Power Networks (UKPN) licence area in London.
- The Modelling & Restoration Tool WG proposed a Restoration Decision Support Tool that will provide recommended restoration routes to Control Engineers during system restoration. The support tool will have the capability to track restoration progress and log decisions of the Control Engineers during the process.
- The Future Networks WG proposed solutions to challenges that may arise from the use of Distributed Energy Resources (DERs) as RCs. The WG also looked at the changes required on the NETs to be ESRS compliant.
- The Communication Infrastructure WG proposed changes to the telecommunication requirements for Network Operators, Transmission Owners (TOs), Offshore Transmission Owners (OFTOs), DNOs and Restoration Contractors and other relevant parties. These changes will enable communication to occur during restoration to guarantee that parties are informed of what steps to take. It also proposed the implementation of ICCP links or equivalent between ESO and all DNOs for Network visibility.
- The Markets and Funding Mechanisms WG proposed funding and a compensation mechanism which will be used by various stakeholders such as Anchor and Top-Up Restoration Contractors, other CUSC parties, Other DERs (Non-CUSC and Non-Contracted), Interconnectors, Non-restoration Users and All Network Owners (TOs, OFTOs, DNOs).

- The Assurance Activities WG proposed Assurance Activities required to be compliant with the ESRS by RCs, ESO, TOs and DNOs. The cadence of each Assurance Activity and reporting was also proposed.
- The Regulatory Framework WG identified all the codes that will be impacted by the new ESRS and proposed associated timeline for updating each framework.

Distributed ReStart Project

The Distributed ReStart Project established the technical viability of using DERs for system restoration. The project had 3 main workstreams:

- The Organisational Systems and Telecommunication workstream assessed the likely impacts of Distributed ReStart to stakeholders.
- The Power Engineering and Trials workstream performed technical evaluation of delivering Distributed ReStart. The workstream established that to enable bottom up restoration, certain technical and resilience requirements are required which are different from the ones we use for Transmission connected generators
- The main deliverable from the Procurement and Compliance workstream was an end-to-end procurement process that enables buying the de-coupled services required for a Distribution Restoration Zone (DRZ) - power island. This means multiple contracts for service from an Anchor and Top-up providers The ESO is currently modifying the Regulatory Framework which would have a consequential impact on the Distribution Code whilst working on competitive tendering to secure the services of interested DERs as RCs.

Distributed ReStart Project Transition Timeline

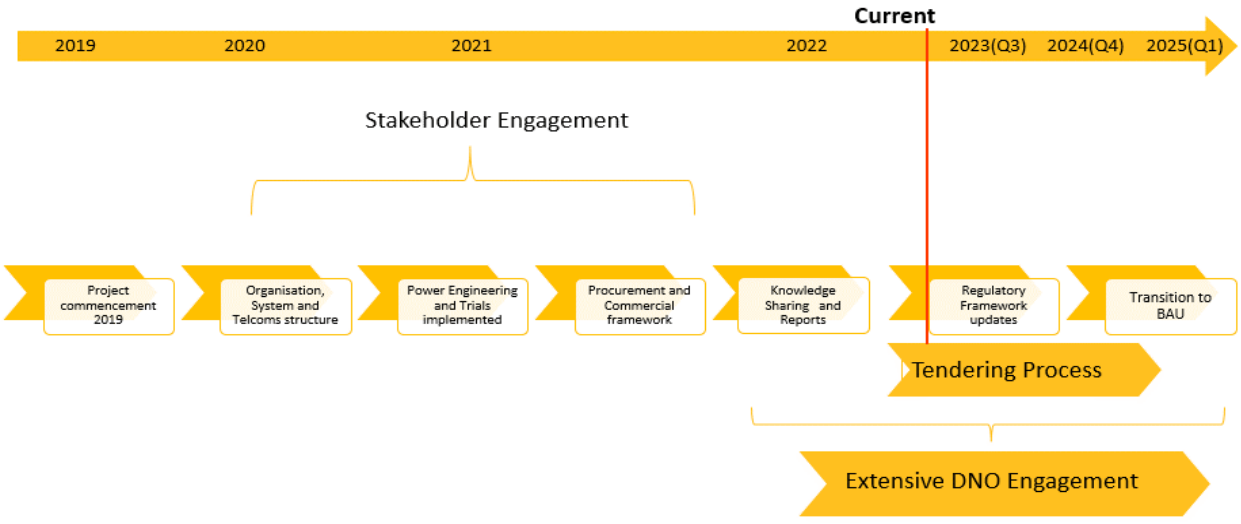


Figure 2-Distributed ReStart Project timeline

High-level findings from the Distributed ReStart project are listed below.

Findings	Integration to BAU
• **Distributed restoration can harness the growth of distributed energy resources (DERs) to provide bottom-up restoration requirements** ○ Over the past three years, Distributed ReStart has proven this capability via thorough testing, live trials and stakeholder engagement discussing the commercial, technical**,** and organisational designs.	• The ESO has revised its strategy from Top-down approach to a more holistic approach which incorporates both top-down and bottom -up approaches to restoration. This will allow the ESO to utilise the growth in DERs for restoration.
• **DERs can contribute towards ESRS compliance** ○ Distributed restoration will be supplementing the traditional restoration service.	• The ESO is procuring Anchor and Top-up restoration services from the distribution network as part of our recent and future tenders.
• **Doing the right thing for all participants** ○ The proposed procurement process provides a more open and transparent route to market for DER providers, through a technology agnostic competitive tender route.	• Existing procurement plans are being updated to replicate what has been done for securing Transmission-led restoration services thus enabling procurement from distribution networks restoration providers
• **The importance of being stakeholder-led** ○ Co-creation with DER stakeholders, DNOs and other industry expertise through numerous webinars, bi-laterals, exercises, live trials and networking with various key industry forums.	• The ESO is working with the wider industry to develop the requirements that will ensure successful implementation of Distributed Restart. The ESO also acknowledges that this process is an enhanced role for DNOs because they know their network better than the ESO therefore we will be collaborating with the DNO from the strategy development stages to implementation.
• **Use of the automated Distribution Restoration Zone Control System (DRZCS) –** ○ A pure ‘manual’ DER-based restoration will be slow and difficult to manage. Our DRZCS designs support automation and acceleration of the process, which could help meet the ESRS regional restoration targets.	• As part of GC0156, the ESO is proposing a standard for Distribution Restoration Zone Control Systems (DRZCS). The standard contains generic characteristics of the DRZCS.

Table 1-Distributed Restart findings and ESO implementation

Wind

Grid Code modification, GC0137 proposed by the ESO and approved by Ofgem in January 2022 introduced the concept of Grid Forming Capability for renewable energy sources. Grid Forming Capability is the ability of a plant to exhibit similar characteristics to that of a conventional synchronous generator. This means DERs especially those from wind sources can participate in RC market because of the integration of independent voltage sources due to Grid forming, giving DERs the ability to start without needing external support from the Grid.

The ESO also issued an invitation to tender (ITT) for potential wind RCs capable of providing restoration services at Transmission level on 28th November 2022 to supplement existing and new restoration provisions across GB. Contracts to successful wind RCs will be awarded in March 2024 for service commencement by December 2026 or 2028.

The modification of STC/STCP has commenced by the ESO which will give further impetus to Offshore wind contributing to restoration.

Industry Codes

In April 2022, a formal Grid Code modification working group was established (GC0156) to further develop the findings from the seven non-code working groups. As a result, four Grid Code subgroups were established with industry wide stakeholders to develop findings for Future Networks, Markets and Funding Mechanism, Assurance Activities, and Communications Infrastructure.

The subgroups met bi-weekly and provided monthly updates to the GC0156 Working group. In October, the four subgroups were dissolved, and the findings formed the basis of the draft legal text that was issued for industry consultation which ran from 21 November 2022- 30 December 2022.

Webinar

To keep the wider industry abreast of code changes as the result of the ESRS, the ESO organised a webinar for stakeholders especially those who have not been part of the GC0156 working groups. The webinar was hosted on 07 December 2022 where the ESO provided an overview of the Regulatory Framework defects and high-level solutions proposed for industry consultation.

The timeline for finalising the Grid Code modification is shown below

Milestone	Date
Workgroup Reports issued to Panel (5 working days)	19 April 2023
Panel sign off that Workgroup Report has met its Terms of Reference	27 April 2023
Code Administrator Consultation	03 May 2023 - 03 June 2023
Draft Final Modification Report (DFMR)	21 June 2023
Panel undertake DFMR recommendation vote	29 June 2023
Final Modification Report issued to Panel to check votes recorded correctly (5 working days)	03 July 2023 - 07 July 2023
Final Modification Report issued to Ofgem	11 July 2023
Ofgem decision	TBC
Implementation Date	10 days after Ofgem decision

Table 2-Timeline for the Grid Code modification

In addition to GC0156, we have implemented changes to other industry codes which will reinforce the ability to restore the System within the ESRS timeline. These include implementation of the EU Emergency and Restoration Code in GB in 2019 (Phase I) and 2022 (Phase II).

Tenders

Procurement activities to date:

Procurement Activities	Regulatory year 2022/23
Northern	New tender launched in October 2022 to replace the previously awarded tenders when they come to an end. The tender introduced the output of the Distributed ReStart project with the introduction of 4 tender categories[3]. The ESO has been inundated with over 202 unique offerings across 11 different technology types. This tender will run until contract awarded in April 2024 with a service start date of November 2025.
SW & Midlands	The SW and Midlands tender was launched in February 2019 and was the first competitive tender to be launched for restoration services. The ESO awarded six contracts through the process and these services went live from July 2022 for five years. The six contracts, five of which were new, totalled in the region of £90million.
South East	New tender launched in June 2022 which included the recommendations of the Distributed ReStart project for the first time round**,** and the introduction of 4 new tender categories. Please note that the enduring solution will deploy only 2 categories: Anchor and Top Up services for both Transmission and distribution network[4]. The ESO progressed 48 unique offerings across 7 technology types during ITT Part 1. The Final stage of the tender is due to be launched Q1 of 2023.
Wind - GB	This one-off initiative to demonstrate that offshore or onshore wind generation can also meet Primary Service technical requirements for restoration services at Transmission level, was launched in August 2022. We received good amounts of interest from different wind providers across the nation, the intention was to have service delivery by Q3 2025 but following feedback from multiple potential providers who explained about their investment project timelines, we provided another option for go-live by 2028 for those able.

Table 3-Procurement Activities for 2022/23

We also reviewed our tendering process and made the following changes:

- Enhance the value of different technologies in each region to support System Restoration
- Providing more route to market through bids against four different categories – Primary Service, Top-up Service for Primary Service and the Distributed ReStart categories – Anchor Generator and Top-up Services
- Reduced some of technical requirements to open the market for more participants, for example availability is now 80% instead of 90%, Block Loading size is reduced from ≥ 20MW to ≥ 15MW and the final tender evaluation weightings changed from 70:30 to 50:50
- Extended the timescales between the different tender stages to allow providers more time to put together a stronger submission. This has extended the length of the end to end tender process by 50%
- Being clearer and more concise within the tender documents about what information (and format) is required from potential bidders
- Greater understanding of availability of the network and the service providers
- Reviewed weighting of the commercial and technical assessment criteria
- Evolve technical requirements to remove barriers to entry

[3] Primary Service, Top Up Service for Primary, and Anchor Generator and Top Up Services for distribution-led projects

[4] The regulatory framework changes regarding ESRS will take effect following Ofgem's approval

- Better appreciation of the timeframes of the tender process including submissions of Feasibility studies and the EPC phase
- Management of external impacts, such as pandemic on the tender process
- Assessing credibility and suitability of providers beforehand (including financial viability)

Restoration Decision Support Tool

We have held various external and internal stakeholder workshops to collate requirements and developed User Stories to support the delivery of the RDST. We also commenced engagement with the selected vendor for the delivery of the ICCP Links to facilitate visibility of the DNO network for the purpose of RDST development.

Restoration Strategy

A Total System Shutdown event has never occurred in Great Britain; this makes it very difficult to test the performance of our restoration capability and arrangement in real time. As such we rely on probabilistic modelling methods to measure the performance of our restoration capability. The latest modelling exercise shows that it will take an average of 32.1 hours to restore 60% of National Demand in 2023. The new standard imposed by the ESRS for the restoration of 60% of National Demand is 24 hours. Figure 3 shows the average time taken to restore 60% of National Demand from 2006 to 2024. The change in trajectory from 2022 to 2023 is due to the impact of potential gas shortage, delayed restoration service contracts, deteriorating level of warmth in units due to infrequent use, plant closures, displacement of existing fossil fuelled generation by wind/solar resulting in uncertainty around inertia, response capability, reactive power, block-load capability, sufficient electrical reach to energise others, site resilience and proven capability.

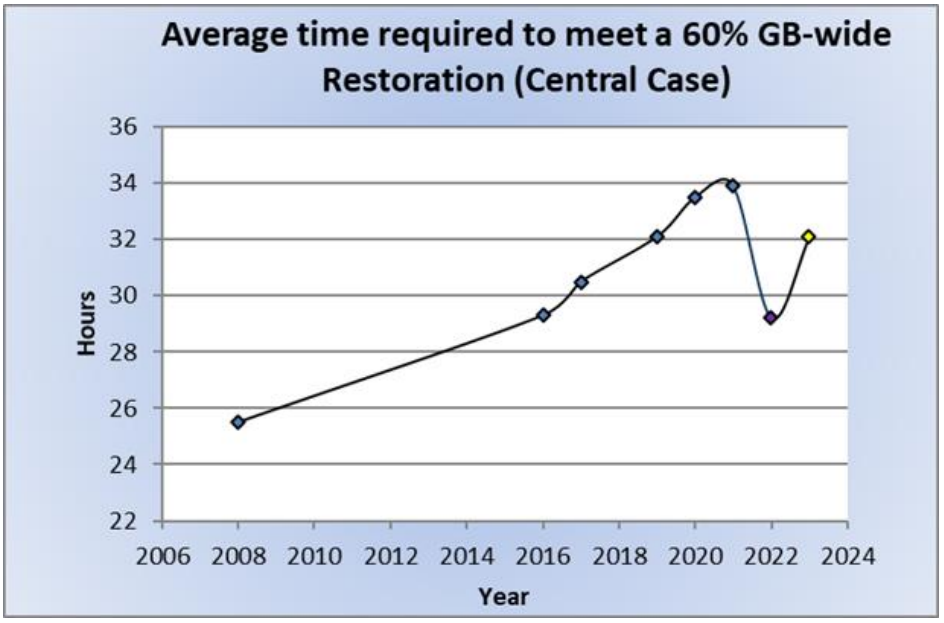


Figure 3-Modelled annual restoration times

We acknowledge that there is a significant amount of work to be done by all the relevant parties to be ESRS compliant by December 2026. To achieve this, we have adopted the following strategy:

- Implementation of learnings from Distributed ReStart: Following the successful trials, Distributed ReStart provides the world first bottom-up approach to restoration to support the traditional top-down approach.

- Industry Code changes which reinforced the ability to Restore the System. These include implementation of the EU Emergency and Restoration Code in GB in 2019 (Phase I) and 2022 (Phase II). In addition, GC0137 (Grid Forming) was introduced into the Grid Code in February 2022 and provides a vehicle for renewable plants to contribute to Restoration.

- Significant increase in tendering for new Restoration Contractors: Our aim is to contract for a minimum of three Restoration Contractors with varying technologies, across each DNO Licence area that make up the 7 restoration regions[5], to allow for uniform restoration across GB.

- Updates to Regulatory Frameworks: Following industry wide engagement, new requirements have been identified for Users[6], Transmission Owners and the ESO, to support restoration and as a result, the Grid Code (GC), Distribution Code (DC), System Operator Transmission Owner Code (STC), Connection and Use of System Code (CUSC), Balancing and Settlement Code (BSC) and Security and Quality of Supply Standards (SQSS) are being updated and will be submitted 3rd quarter 2023.

- Development of a Restoration Decision Support Tool: This tool would recommend optimised restoration routes to Control Engineers for implementation, provide real-time restoration progress on both the Transmission & Distribution Network, and for logging critical decisions during the restoration process.

- The inclusion of Offshore Generation in the restoration process.

- Compliance Monitoring: Probabilistic modelling of the recommended changes to provide a forecast view of compliance by 2026, implementation of Assurance Activities for all parties involved in restoration and ongoing tripartite engagement with BEIS and Ofgem.

[5]North Scotland, South Scotland, North East, North West, Midlands, South East, South West.

[6] CUSC parties, Network Operators, DC Converter Station owners, HVDC Equipment Owners.

Risks to strategy

Several risks have been identified for the proposed strategy to restore Transmission Demand to meet ESRS by 2026. The risks envisioned have been grouped under organisational risks, project delivery risks, market risks and regulatory risks. The ESO's mitigation strategy is to continuously analyse and assess all potential risks to identify any changes in their level of severity and propose adequate mitigations for them.

Table 4 shows some of the identified risks to ESRS implementation under the risk categories.

Risk Category	Potential risks	Mitigation
Organisational Risks	• Lack of resources • Impacts from other ESO led projects • Delay in the Restoration Decision Support Tool dependencies	• Procure or recruit more resources for ESRS • Explore the use of alternatives
ESRS Compliance monitoring risks	• Inadequate resources in place for compliance monitoring for the wider industry including ESO	• Procure or recruit more resources for compliance monitoring
Market Risks	• Lack of sufficient interest in the launched tenders by potential RCs • Disproportionate nature of DERs location across restoration regions e.g. Western Isles • Delivery from existing plants ****Market risk (REDACTED)****	• Continue regional approach for launching tenders
Regulatory risks	• Alternative solutions raised to Code modification which may delay the process • Difficulty in the coordination of several code modifications at a time • Potential delays with approvals • DNOs may not be confident in setting up DZR-Controllers.	• Continue to work with industry to attain amicable solutions • Work with Code Admin to manage conflicting timescales • Provide sufficient support to Ofgem to aid prompt approval • Maintain ongoing support for DNOs in implementing DRZCs
Environmental Risks	• Environmental impacts from the use of diesel plants in meeting 72 hours resilience requirement.	• Encourage industry to use greener solutions

Table 4-Risks affecting restoration strategy and mitigations

Restoration Approach

Current Restoration Approach

The current restoration approach is to use contracted large power stations and interconnectors to energise sections of the Transmission System using local Demand to establish stable power islands in line with pre-agreed Local Joint Restoration Plans (LJRPs). Subsequently, other generators will join the growing System, and the synchronization of power islands progressively takes place to re-energising the whole network and restore Demand across the country until full restoration is completed.

The issue with this approach is that it does not consider using DERs as RCs in the restoration process. The ESO is proposing a holistic Restoration Approach that considers both top- down and bottom- up approach to restoration.

New Restoration Approach

To be ESRS compliant by December 2026, the ESO is adopting a restoration approach that implements both traditional and non-traditional Restoration Contractors. This approach removes barriers to entry to markets allowing DERs to participate in restoration.

The proposed approach includes:

- Launch tenders to secure additional Restoration Contractors across GB: This will mean a significant increase in the volume of potential Restoration Contractors available for consideration ahead of awarding contracts.

- Adopt a regional approach to system restoration: Our Control Room Engineers are currently able to implement 2 LJRPs in parallel per region, by implementing changes anticipated to meet the ESRS, this would increase to 21 (three in each region) on the Transmission network in conjunction with at least 5 Distribution Restoration Zone Plans (DRZP) on the Distribution Network.

- Adopt the Restoration Decision Support Tool: Currently, the process for deciding which LJRP to implement is carried out manually. This is prone to human errors and is time consuming. Introduction of the RDST will recommend optimised restoration routes to our Control Engineers which would improve restoration time.

- Share forecast demand data: The integration or development of a new platform for sharing the forecast demand data will create awareness to industry on the level of Transmission Demand that needs to be restored.

- Coordination of industry wide Assurance Activities: All parties involved in the restoration process will be expected to provide assurance data and/or test results on a continuous basis. The ESO will be responsible for compiling the assurance results and presenting it to BEIS and Ofgem.

The ESO acknowledges the fact that service availability of Restoration Contractors is essential for the Restoration Approach to work. There may be instances where a provider may not be available for restoration within a region due to outages of related assets. When this occurs, the ESO will manage electricity sharing to ensure a balanced regional restoration across GB.

I. Regulatory years – 2023/2024

We hope to finalise regulatory changes required to implement ESRS within this period. Progress on the proposed modifications to the Grid Code, BSC, CUSC and STC via the respective governance process is on track. We are expecting to have decisions from Ofgem on the Grid Code Modification by July 2023.

Framework	ESRS Presentation to Panel	Modification workgroup established	Recommendations drafted	Industry Consultation	Draft Modification Report	Issue Modification to Ofgem
Grid Code	✓	✓	✓	✓	May 23	Jul 23
CUSC	✓	✓	✓	✓	✓	Jul 23
STC	✓	✓	Apr 23	Apr 23	Sep 23	Sep 23
BSC	✓	Apr 23	Jun 23	Aug 23	Oct 23	Oct 23
SQSS	Apr 23	May 23	Jul 23	Aug 23	Sep 23	Sep 23

Table 5-Code modification timelines

The progress in the tendering process for new Transmission and distribution RCs for the Southeast, Northern Region and wind across GB are shown in table 6 below. The ESO will commence exploring additional tendering processes for other regions to secure more RCs.

	Expression of Interest	Assessment	Contract Award	Build	In Service
South East	✓	Oct 22-Nov 23	Dec 23	Jan 24 -Jun 25	Jul 25
Northern	✓	Feb 23 – Mar 24	May 24	May 24 – Oct 25	Nov 25
Wind	✓	Dec 22 – Dec 23	Mar 24	Mar 24 – Jul 25	Dec 26 or 28

Table 6-Competitive tendering timelines

Further engagement is planned over 2023 with relevant stakeholders on the delivery of the data links in order to facilitate visibility of the DNOs network which is essential for delivery of the RDST.

The ESO will also be identifying a suitable vendor for the RDST. Further engagements to define project scope to the selected vendor will be carried out during this regulatory year.

II. Regulatory years – 2024/2025, 2025/2026

The Restoration Approach will be reviewed at an annual basis, to ensure that the ESR capability procured is at pace with all relevant technologies and network infrastructure. Any significant network infrastructure change or providers' geographical dispersion will also trigger a review of Restoration Approach.

This will include, but is not limited to:

- Whole System Approach: Any future Restoration Approach needs to consider future trends in generation and network design, and the ability to adapt to new technologies whilst maintaining reliance of restoration. In some areas, further network investment may be required to enable alternative restoration methods.

- Results from competitive procurement event: More Providers who were awarded contracts in the tenders for SW & Midlands and the Northern tender will now be delivering services in this timeframe.
- Further competitive procurement events will be launched for the ESRS implementation with an aim to have contracts in place by end of 2024. Then engagement with successful participants will follow to have the services available by 2026.
- Industry wide Assurance Activities and training as agreed in the Assurance Activities workgroup will commence in this timeframe.
- Restoration Decision Support Tool go-live is planned for 2024/2025.
- ESO recruitment campaign to increase number of employees within relevant teams and the Control Room.
- Further progress and engagement with the industry for ESRS implementation will continue. The industry will make changes to their infrastructure to implement the ESRS.

The ESO will continue to explore new provider technologies and innovative Restoration Approaches to improve the efficiency of the service.

III. Subsequent Regulatory years (beyond 2026)

The ESO and the wider industry is expected to be compliant to ESRS by implementing all the requirements specified in the Grid Code and other Codes modifications. The compliance deadline for ESRS is 31st December 2026.

Part of the ESO's focus post this deadline will be:

1. Compliance monitoring, Assurance Activities and testing to verify both ESO's and the wider industry's compliance with ESRS.
2. Continuously improve the Restoration Plan by reviewing the restoration strategy to identify any deficiencies and provide adequate solutions.

The future procurement plans for South West & Midlands, South East and Northern RCs are shown in table 7. This plan will ensure the minimum capability required to achieve ESRS beyond the compliance deadline is maintained when existing RCs contracts expire.

South West & Midlands	South East	Northern
Existing contracts expire circa August 2027	Existing contracts expire - 31 July 2030	Existing contracts expire - 31 December 2030
New contract Service go-live -June 2027	New contract Service go-live - August 2030	New contract Service go-live -January 2031
Build (20 months)	Build (20 months)	Build (20 months)
Contract award – November 2025	Contract award – April 2028	Contract award – September 2029
ITT F2 (1 year) – November 2024	ITT F2 (1 year) – April 2027	ITT F2 (1 year) – September 2028
ITT F1 (5 months) – June 2024	ITT F1 (5 months) – December 2026	ITT F1 (5 months) – April 2028
EOI (4 months) – January 2024	EOI (4 months) – August 2026	EOI (4 months) – January 2028
Market Engagement – November 2023	June 2026	Market Engagement – November 2027

Table 7-Procurement plans

Procurement Approach and Provision of restoration services

The ESO strictly adheres to the Procurement Guidelines as prescribed in condition C16 of ESO Transmission Licence for the procurement of RCs. The procurement and contracting strategy adopted by the ESO to meet ESRS is to maintain 5-year contracts with different generator types regionally by running cyclical competitive tenders. The ESO also monitors regional-based ESR availability over short to long term periods to identify any gaps or needs within each region. The procurement activities for the regulatory year 2022/23 and years up to 2026 are shown in table 8.

Procurement Activities	Regulatory year 2023/24	Regulatory year (2024-2026)
Northern	Tenders launched in 2022 in flight.	Contracts awarded in Q4 2025.
SW & Midlands	New tender launch potentially Q3 2023.	Tender in flight.
South East	Tender in flight.	Contracts awarded in Q3 2025.
New RCs Contracts Awarded	None.	TBC following results of the three tenders launched in 2022.
RC contracts renewed	Potentially five.	None.

Table 8-Procurement and contract activities in 2022/23 up to 2026

Competitive Tendering over bilateral contracts

The ESO has had experience with both bilateral contracts and competitive tendering for RCs. Bilateral contracts were used in the early stages of Electricity System Restoration when there were fewer generators that could provide restoration services. With the increasing number of potential Restoration Contractors, the ESO changed to competitive tendering to improve market liquidity and to get the best commercial value which drives down the end consumers costs and avoid the monopoly by certain generator types in various restoration regions.

Benefits of tendering for RCS

- Tenders provide a transparent mechanism to meet the needs of competition law.
- The service specification is available to all prospective suppliers to consider, and each option is considered on its own merit.
- Cost and quality are both factors in the decision process and suppliers can see how this play out.
- Selection and awarding of contracts follow an agreed transparent assessment process with various checkpoints and sanction processes to control activities.
- Decisions are formed through process and a team of staff working on different aspects.
- Services are selected in overall attractiveness order, up to a cut-off point.
- Where sufficient liquidity exists, the price dynamic becomes a bigger driver offering cost savings.
- Larger expenditure justifies greater scrutiny and business management effort, so resources are allocated accordingly.
- There's an opportunity to collaborate with the relevant DNO/DSOs as part of the tendering for Distributed restoration projects. This enables more informed decision making as the DNO/DSO can share their region's information with the ESO and collectively agree how the Distribution Restoration Zone might work best with other Transmission-led projects.

Monitoring compliance

The structure of oversights in compliance monitoring of ESRS is shown in figure 4. The ESO and Ofgem will constitute the monitoring body to assess individual, regional and GB assurance levels. This process will be aligned to the Assurance Framework. The template for assurance level submissions to the ESO has been drafted as part of the update to the regulatory framework and has been embedded in Appendix 1.

Following confirmation of assurance from the wider industry, the ESO will coordinate the responses and present to Ofgem via the annual Assurance Framework submissions. We aim to commence the process in 2024/25 to provide a progress update on deliverables towards achieving ESRS by 31st December 2026.

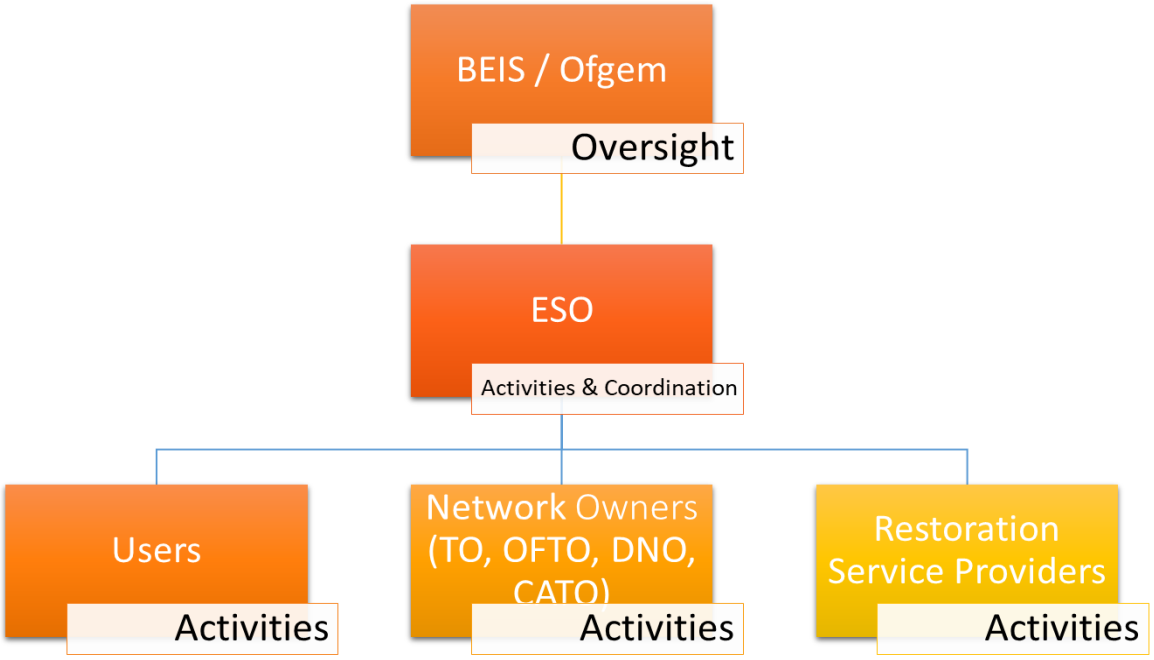


Figure 4-Compliance Monitoring framework

As part of the role of the Assurance Activities subgroup established by GC0156, a comprehensive list of activities was identified which includes but not limited to:

- Restoration network review: Evidence should be provided to show that new or reconfigured parts of the Transmission or Distribution System meet ESRS requirements. This will ensure that ESRS is considered during network planning stages. Responsible parties include ESO, TOs, OFTOs, TO HVDC Networks, DNOs & IDNOs (directly connected only).

- Distribution Restoration Zonal Control test: This should be carried out at least once every three years to demonstrate the technical capability of a DRZCS to operate as per the Distribution Restoration Zone Plan (DRZP). The test is Network Operator led, along with Restoration Contractors and the ESO.

- Dead Line Charge test: This test is done to check the capability of an Anchor Restoration Contractor to energise a dead section of the system without the aid of external supplies. This is to ensure that Anchor RCs can restore the System during Partial or Total System Shutdown. Responsible parties during Dead Line Charge test includes: Transmission Licensees, relevant Network Operators, Anchor Restoration Contractors and the ESO.

- Communications Assurance: This is to confirm that all potential communication failure scenarios have been envisaged and adequate contingencies are in place. CUSC Parties, relevant Network Operators, relevant Transmission Licensees, Restoration Contractors and the ESO shall confirm that their communication infrastructures have a minimum of 72 hours resilience during Total or Partial Shutdown.

- Assurance Visits: Assurance visits to RCs to validate documentation, operational and training procedures in place to support Restoration. The visits will be ESO led affecting Relevant Transmission Licensees, relevant Network Operators to visit Restoration Contractors.

**** Probabilistic Modelling (Redacted)****

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Appendix 1-Assurance Activities template

Assurance Activity	Grid Code Reference	Parties Involved	Frequency of Assurance Activity	The Company Witness required	Date of test result submission/visit	Annual Statement of Compliance (Y/N)
System Restoration Power Island review	OC9.4.7.6.1 OC5.7.4(iv)	**Relevant Transmission Licensees**, **Network Operators** and **The Company**	Every 3 years	Not applicable		
System Restoration Power Island availability assessment	OC9.4.7.6.1 OC5.7.4(iv)	**Relevant Transmission Licensees**, **Network Operators** and **The Company**	Yearly	Not applicable		
Remote Synchronisation test - TO/DNO	OC5.7.2.1(g) OC5.7.2.3 (d)	**Relevant Transmission Licensees**, relevant **Network Operators**, **Restoration Contractors** and **The Company**	Every 3 years	No		
Low Frequency Demand Disconnection Relay test	CC.A.5.4.3 / ECC.A.5.4.3	**Relevant Transmission Licences**, relevant **Network Operators**, **Non-Embedded Customers** and **The Company**	Every 3 years although this may be extended to no more than every five years if considered to be required for operational purposes	No		
Anchor Restoration Contractor test	OC5.7.2.1 /OC5.7.2.2 / OC5.7.2.3	**Relevant Transmission Licensees, Network Operators**, **Anchor Restoration Contractors** and **The Company**	Every 3 years	Yes		

Top Up Restoration Contractor test	OC.5.7.2.4	**Relevant Transmission Licensees**, **Network Operators**, **Top Up Restoration Contractors** and **The Company**	Every 3 years	Yes		
Resilience to **Partial Shutdown** or **Total Shutdown** of **Restoration Contractor**	OC9.4.7.6.2 OC5.7.4.2(iv)	**Restoration Contractors** and **The Company**	Yearly	No		
Quick Resynchronisation Unit Test	OC5.7.2.5	**EU Generators** in respect of **Type C** and **Type D Power Generating Modules**, relevant **Network Operators** and **The Company**	Yearly	Yes		
Distribution Restoration Zone Control System test	OC5.7.2.6 Electrical Standard - Distribution Restoration Zone Control System High Level Functional Specification	**Network Operators**, **Restoration Contractors** and **The Company**	Every 3 years	Yes		
Dead Line Charge test	OC5.7.2.1(g)(a) OC5.7.2.3(d)(a)	**Transmission Licensees**, relevant **Network Operators** **Anchor Restoration Contractors** and **The Company**	Every 3 years	Yes		
Remote Synchronisation test -**Restoration Contractor**	OC5.7.2.1(g)(b) OC5.7.2.3(d)(b)	**Relevant Transmission Licensees**, relevant **Network Operators**, **Restoration**	Every 3 years	Yes		

		Contractors and **The Company**				
Assurance Visits	OC5.7.4 OC5.7.5	**The Company, Relevant Transmission Licensees**, relevant **Network Operators** to visit **Restoration Contractors**	Every 3 years	Yes		
Voice Systems Resilience test or equivalent	OC5.7.4.2(vi)	**CUSC Parties,** relevant **Network Operators, Relevant Transmission Licensees Restoration Contractors** and **The Company**	Yearly	No		
Critical Tools and Facilities control systems resilience demonstration – power resilience including power resilience demonstration & connectivity and alarm event handling	OC5.7.2.6 OC.5.7.4.2(iii) OC5.7.4.2(ix) OC5.7.4.3 CC.7.10 ECC.7.10	**CUSC Parties,** relevant **Network Operators, Relevant Transmission Licensees**, **Restoration Contractors** and **The Company**	Yearly	No		
Control systems resilience demonstration – diagram & topology	OC5.7.2.6 OC.5.7.4.2(iii) OC5.7.4.2(ix)	**CUSC Parties,** relevant **Network Operators, Relevant Transmission Licensees**, **Restoration Contractors** and **The Company**	Yearly	No		
Cyber-Security	CC.7.10.6 ECC.7.10.6 OC.5.7.4.2(iii)	**CUSC Parties,** relevant **Network Operators**, **Relevant**	Yearly	No		

	OC5.7.4.2(x)	**Transmission Licensees**, **Restoration Contractors** and **The Company**				
Telephony services test per month as per CC/ECC.6.5.4.	CC.6.5.1 – CC.6.5.5 ECC.6.5.1 – ECC.6.5.5 OC.5.7.4.2(vi) OC5.7.4.2(xi) OC5.7.4.2(xii)	**CUSC Parties,** relevant **Network Operators,** relevant **Transmission Licensees**, **Restoration Contractors** and **The Company**	Yearly	No		
Resilience to **Partial Shutdown** or **Total Shutdown** of **CUSC Parties**	OC5.7.4 OC5.7.5	**CUSC Parties** and **The Company**	Yearly	No		
Restoration Procedure review	OC9.4.7.6.2 OC5.7.4.2(iv)	**The Company, Relevant Transmission Licensees**, relevant **Network Operators**, **CUSC Parties** and **Restoration Contractors**	Every 3 years	Not applicable		
LJRP & DRZP reviews	OC9.4.7.6 OC5.7.4.2(iv)	**The Company**, **Network Operators**, **Transmission Licensees** and **Restoration Plan** signatories	Every 3 years	Not applicable		
Awareness training for **Restoration Contractor** and **CUSC Parties**	OC9.4.7.6.2 OC5.7.4	**The Company,** relevant **Network Operators, Transmission Licensees**, **CUSC Parties** and	Every 3 years	Not applicable		

		Restoration Contractors				
Cross industry training	OC9.4.7.6.2 OC5.7.4	**The Company**, **Network Operators**, **Transmission Licensees**, **CUSC Parties** and **Restoration Contractors**	Every 3 years	Not applicable		

Table 9-Assurance Activities template

Appendix 2-Restoration Regions

There are 7 Restoration Regions. The Restoration Regions are shown in the diagram below.

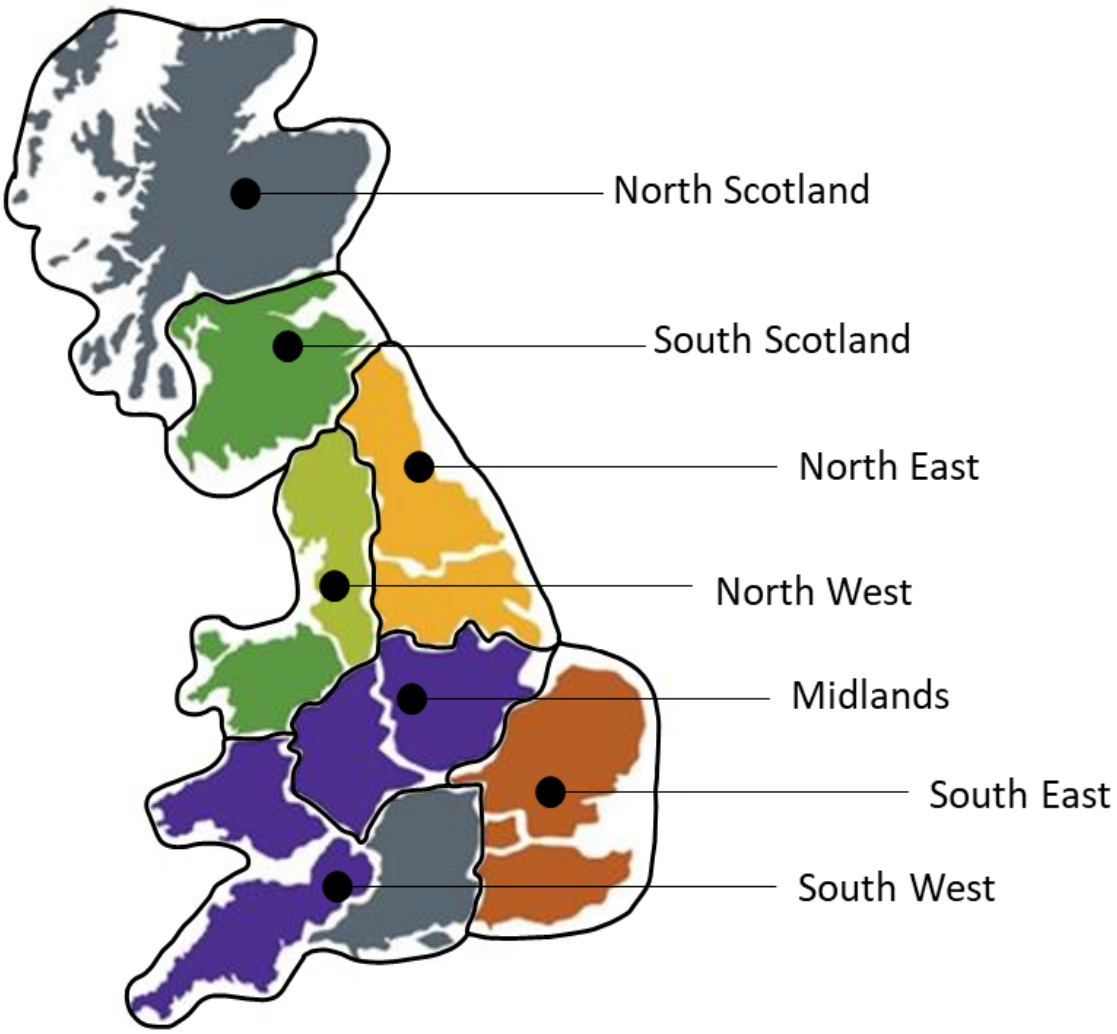

Figure 5-Restoration Regions

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Appendix 3-ESRS implementation and Assurance Activities timeline

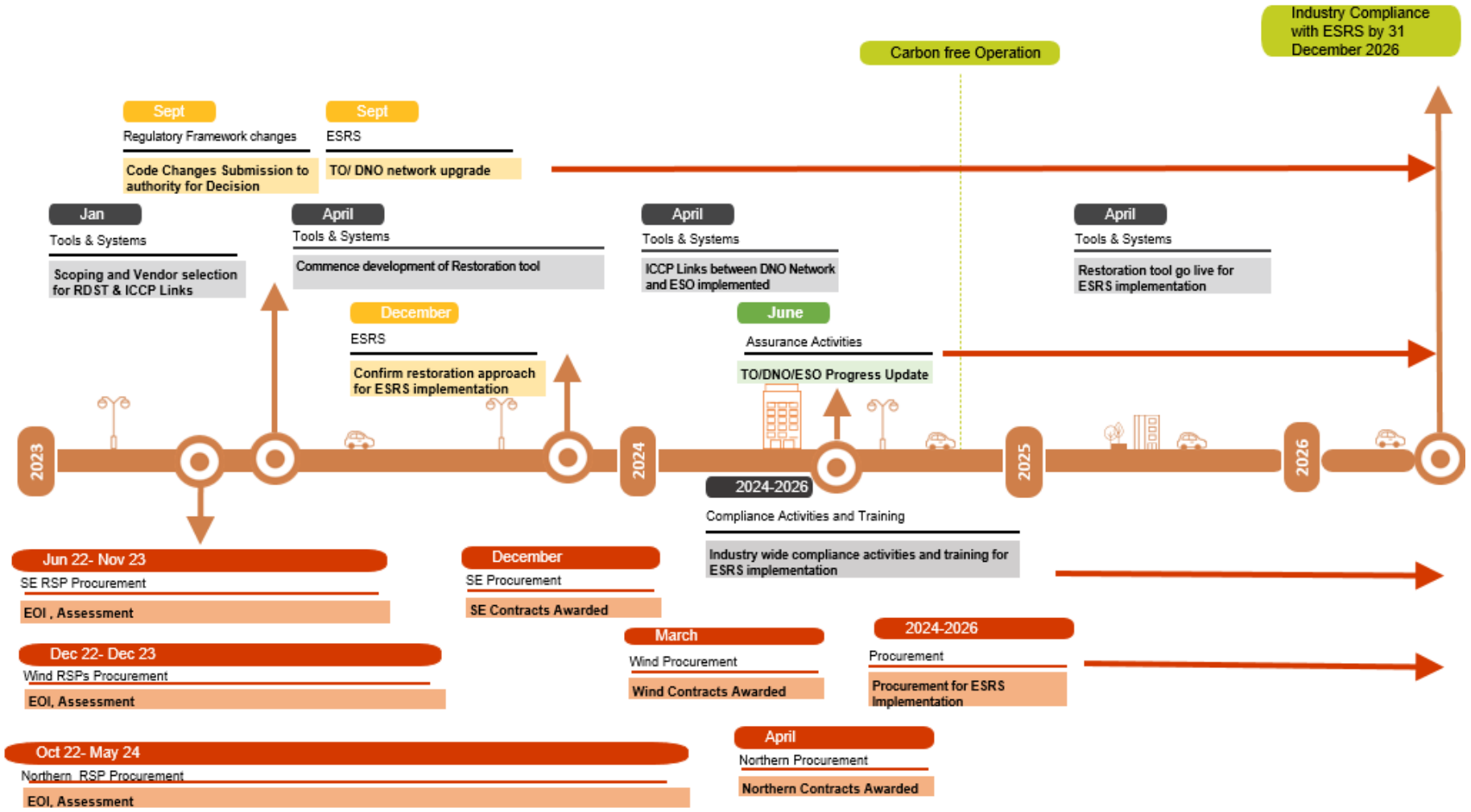

Figure 6-ESRS implementation and Assurance Activities timeline

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Appendix 4-Progress Update on Activities in Assurance Framework 2022/23

Activities under Regulatory year 22/23	Progress
1. Transition from the current strategy to the ESRS	• The ESO continues to identify the gaps in the current strategy and propose a more holistic strategy that will ensure compliance to ESRS which includes implementing the recommendations from the Distributed ReStart project. The strategy is presented in this year's Assurance Framework.
2. Improving the restoration time, whilst broadening participation for ESR services	• The restoration times as shown in the model for GB is 32.1 hours for 2023 which is worse than the 29.2 hours achieved in 2022. This is due to a changing portfolio of contracted services and changing market conditions including levels of unit warmth at some key locations. • However, it is crucial to note that implementing the new restoration strategy will reduce the restoration time to comply with ESRS. See redacted section.
3. Increase both the market awareness of the service and open the service to a wider range of providers	• We increased awareness about the service via several industry engagements and have launched 3 tenders in the last year (2022) with significant interest from a range of providers. In addition, our strategy is to have a minimum of 3 different technologies in each DNO licence area, but we acknowledge this may be challenging.
4. Categorise providers' capability according to their contribution to different phases of restoration. This will be further reviewed, evolved, and enhanced as the industry workgroups (formed to deliver ESRS implementation) are progressed.	• The thinking has evolved around the use of different phases as specified in the Assurance Framework 2022/23, however, Transmission connected Restoration Contractors are expected to respond within 2 hours whiles Distribution connected Restoration Contractors within 8 hours. • The terms ''Anchor'' and ''Top-up'' have also been introduced into the Grid Code legal text drafting (GC0156) to differentiate between parties contracted to provide restoration services based on their level of involvement in the restoration process.

5. Have sufficient secondary levels of generation[1] available for an efficient and sustainable restoration following the initial stages.	• The restoration strategy has evolved since the last Assurance Framework. To achieve ESRS, all CUSC parties are proposed to have 72 hours resilience following Partial or Total System Shutdown. This will ensure sustainable restoration following initial stages.
6. Develop a Restoration tool as per RIIO2 business plan. Initial discussions on this tool commenced in October 2021 with an expectation to further develop from early 2022.	• We have held various external and internal stakeholder workshops to collate requirements and develop User Stories to support the delivery of the Restoration Decision Support Tool. • We have also viewed prototypes from other organisations with restoration tools. • We are in the process of launching Request for Interest.
7. A full tender for the Southeast (SE) region will be launched from Q1 2022	• New SE tender launched in June 2022 which included the recommendations of the Distributed ReStart project for the first-time round**.** • The ESO progressed 48 unique offerings across 7 technology types during ITT Part 1. The Final stage of the tender launched in Q1 of 2023.
8. Competitive tendering process for Northern regions	• New Northern tender launched in October 2022 to replace the previously awarded tenders when they come to an end. • The ESO has been inundated with over 202 unique offerings across 11 different technology types. This tender will run until contract awarded in April 2024 with a service start date of November 2025.
9. Wind	• The ESO launched a one-off initiative to demonstrate that offshore or onshore wind generation can also meet Primary Service technical requirements for restoration services at Transmission level in August 2022. • We received good amounts of interest from different wind providers across the nation, the intention is to have service delivery by Q3 2025 but following feedback from multiple potential providers who explained about their investment project timelines, we provided another option for go-live by 2028 for those able.

[1] Secondary level of generation is now referred to as non-restoration CUSC parties.

10. Distributed Restart	• The tenders mentioned above included potential providers from the DNO Network (Distributed ReStart) to support the strategy which is bottom-up and top-down approach to restoration.
11. Ongoing industry collaboration to implement the ESRS alongside the obligations in the Network Code on Emergency & Restoration (NCER).	• Comprehensive industry collaboration commenced in April 2022 for the Grid Code modification (GC0156) and consequential modifications are being progressed for STC, SQSS, BSC, CUSC and Electrical Standard for Control and System Telephony.
12. Changes to Grid Code, SO-TO Code Procedures (STCP), potential expansion of SGUs (Significant Grid User) to ensure a more resilient restoration and updates to the electrical standards for Control and System telephony.	• Modification processes to Grid Code (GC0156), STC (CM089), STCP (PM0128), CUSC (CMP398), BSC (P451) and Electrical Standard for Control and System Telephony are ongoing.

Table 10-Progress Update on Activities in Assurance Framework 2022/23