SP Energy Networks

RIIO-ED2 Electricity System Restoration (ESR) Re-opener

Main Document

June 2025

Abstract

This submission is made under the Electricity System Restoration Re-opener, Electricity Distribution Special Licence Condition 3.2 (Part C). This is a single submission for SP Energy Networks and provides sufficient detail on the requirements for investment in both SPD and SPM with costs and workings called out for each licence throughout this submission.

This submission is accurate and robust, representing good value for consumers. It has been reviewed to assure its quality, to ensure that it contains high quality information and is valid against all licence requirements and Ofgem's re-opener guidance detail. We have met the requirements around Ofgem pre-engagement, having first notified Ofgem of our intention to make a submission during the June 2025 window on 11 February 2025 and via subsequent engagement prior to the re-opener application window. The application has also been subject to internal governance and has received sign-off at Director level.

Appendix 1 includes a mapping table of all requirements and their location within this submission, with a glossary of terms located in Appendix 2. Details of cost compliance are outlined in Appendix 3, and CBA & EJP compliance is outlined in Appendix 4.

The expenditure included in this re-opener is all to be incurred after 1st April 2023 related to changes to the ESR Scope of Work agreed with NESO after 1 December 2021. This represents additional activity which is over and above that already provided by relevant ex-ante allowances, or other uncertainty mechanisms.

Costs have been developed for this submission by reviewing our RIIO-ED2 unit costings and comparing these against recent quotes for the proposed activities, ensuring our proposed costs are accurate and efficient. All costs presented are in 2020/21 prices.

A redacted version of this submission has been provided separately for wider publication.

Any questions or requests for supplementary information should be directed as below:

Matthew Jones, Head of Asset Management & Investment
Network Planning & Regulation
[redacted]

Contents

1. Executive Summary

Full or partial shutdown of the electricity network are identified as risks on the National Risk Register. A failure has the potential to severely disrupt our country so maintaining a secure and resilient electricity supply is a key national priority. The process of recovering from this situation is known as Electricity System Restoration and the industry standard which governs this process is known as the ESRS (the Electricity System Restoration Standard).

We are increasingly dependent upon electricity, powering everything from our homes and workplaces, keeping us warm, powering our vehicles and supporting essential services like healthcare and communication. When the supply is disrupted, it can lead to significant challenges and have a profound impact, reminding us of the vital role electricity plays in our daily lives and the importance of ensuring a reliable supply.

This re-opener application is being submitted because there have been changes to the Electricity System Restoration Standard (ESRS), which will require additional investment in our distribution networks beyond what was set out within our RIIO-ED2 business plans and included within our agreed ex-ante allowance.

The new ESRS has significantly strengthened the regulatory framework by setting targets for restoring 60% of regional electricity demand within 24 hours and 100% of national demand within five days. This will enhance the resilience and reliability of the electricity system, ensuring a swift recovery from major disruptions and driving improvements in restoration strategies and capabilities.

We have an obligation, through licence and grid code compliance, to support NESO requirements through various critical actions during the restoration procedure. From a Distribution Network Operator (DNO) perspective, these responsibilities include, but are not limited to, providing power corridors under the Local Joint Restoration Plan (LJRP) and the operation of 3 Distributed Restart Zones (DRZ), picking up bulk demand to support a safe and stable restoration.

The new responsibilities mean that we need to have certain infrastructure and resources in place to meet the stringent restoration targets. SPEN's role in this framework is crucial for maintaining the resilience and reliability of the electricity supply during such critical events.

Based on a comprehensive and robust assessment, we have identified 7 priority initiatives that are required to deliver ESRS, and this will require an additional expenditure of £50.757m in SP Distribution (SPD) and £14.486m in SP Manweb (SPM). These initiatives are summarised below and outlined in more detail in the subsequent sections of this submission:

Initiative 1 - 132kV Network Resilience – improving the resilience of our 132kV network within SPM, enabling the SPM network to play a key role in establishing initial, local Power Islands in line with the NESO restoration strategy, before providing interconnection to support Regional Restoration Plans.

Initiative 2 - Primary Substations Network Resilience - improving the resilience at a portion of our SPD and SPM primary substations through the installation of batteries and black start controllers.

Initiative 3 - Substation Telecommunications Resilience - increasing the telecommunications resilience at the majority of SPM grid, SPD and SPM primary substations to 5 days to comply with the ESRS.

Initiative 4 – Distribution Restoration Zone (Central Scotland) - the establishment of a Distribution Restoration Zone (DRZ) and growth of a Distributed Island within the Central area following a system restoration event.

Initiative 5 - Distribution Restoration Zone (Dumfries & Galloway) - the establishment of a Distribution Restoration Zone (DRZ) and growth of a Distributed Island within Dumfries & Galloway following a system restoration event.

Initiative 6 - Distribution Restoration Zone (Fife) - the establishment of a Distribution Restoration Zone (DRZ) and growth of a Distributed Island within the Fife area following a system restoration event.

Initiative 7 - Staff Resources - ensure that the right workforce is in place to ensure successful delivery of our proposed network resilience and DRZ initiatives.

Table 1 - Initiatives proposed under ESR Re-opener

Initiative	SPD	SPM	SPEN
Initiative 1 - 132kV network Resilience	-	£3.904m	**£3.904m**
Initiative 2 - Primary Substations Network Resilience	£2.061m	£3.937m	**£5.998m**
Initiative 3 - Substation Telecommunications Resilience	£3.366m	£4.928m	**£8.294m**
Initiative 4 - DRZ – Central Scotland	£14.975m	-	**£14.975m**
Initiative 5 - DRZ – Dumfries & Galloway	£3.940m	-	**£3.940m**
Initiative 6 - DRZ - Fife	£18.925m	-	**£18.925m**
Initiative 7 - Staff Resources	£7.490m	£1.717m	**£9.207m**
Total Costs (ESRt)	**£50.757m**	**£14.486m**	**£65.244m**
			All costs are in 2020/21 prices

This document sets out an effective and efficient approach to the investment that needs to be undertaken as a DNO as a result of the changes to the Electricity System Restoration Scope of Work. It has been produced in alignment with Ofgem RIIO-2 Re-Opener Submission Instructions and Guidance and our Distribution licence special conditions.

This document alongside our supporting annexes and Cost Benefit Analysis forms our application under Special Licence Condition 3.2, Part C.

2. Background

Having a resilient and reliable electricity network is essential to the functioning of a modern society. This includes having a network that can operate in the aftermath of disruptions caused by natural disasters, cyber-attacks, or other unforeseen events.

The additional funding outlined in this re-opener submission is required to enhance the safety, stability, and sustainability of our energy infrastructure. By prioritising the 7 initiatives outlined in this submission, we can have more confidence in the robustness and resilience of our electricity system to meet the needs of our society now and in the future.

2.1. Context

Risks to the Electricity System

A full or partial shutdown of the electricity network are identified as risks on the National Risk Register[1]. A failure has the potential to severely disrupt all other critical systems, resulting in greater consequences than typical outages.

The process of recovering from this situation is known as Electricity System Restoration, and involves the following stages:

- Immediate review of the operating state of the network immediately prior to shutdown including the conditions causing the event.
- Initial switching by DNOs and TSOs to prepare the de-energised network for staged restoration.
- DNOs/TSOs and selected local power stations work together to energise small sections of network in accordance with pre-defined Local Joint Restoration Plans (LJRPs).
- TSOs reconnecting sections of the Transmission network to form Power Islands by interconnecting LJRPs, establishing a transmission skeleton.
- TSOs managing the reconnection of demand and generation, balancing the system to restore the network.

The UK has never experienced a nationwide loss of power and while the likelihood is low, similar events have occurred internationally. In 2019 across Argentina, Paraguay and Uruguay an estimated 48 million people were left without power following a failure in the electricity system. In 2024 and 2025 in Nigeria a series of electricity system failures have caused ongoing disruption for the entire country. More recently, a significant power outage affected mainland Portugal and peninsular Spain, lasting around ten hours in most areas. The blackout caused severe disruptions in telecommunications, transportation, and emergency services. Spain's main business lobby CEOE estimated it would cost 1.6 billion euros in Spain.[2]

[1] National Risk Register - 2025 Edition
[2] Post-blackout in Spain and Portugal, companies count the cost | Reuters

While the UK has one of the most reliable energy systems in the world, maintaining a secure and resilient electricity supply is a key priority. Therefore, as much as we may hope it will never occur, we must adequately prepare for the worst-case scenario.

According to the National Risk Register, in the reasonable worst-case scenario, a nationwide/regional loss of power would result in secondary impacts across critical utilities networks (including mobile and internet telecommunications, water, sewage, fuel and gas) and transport services (rail, road and aviation) would be disrupted due to the failure of electronic systems. This would cause significant and widespread disruption to public services provisions, businesses and households, as well as potentially loss of life.

Reasons for failure could include an extreme weather event (flooding, storms, extreme heat), a cyber-attack, physical attack or sabotage or cascading technical failures. Understanding these risks is crucial for developing robust strategies to mitigate their impact and ensure resilience.

To address these risks, it is essential to implement comprehensive mitigation strategies.

Role of Substations During a Restoration Event

Substations are a critical part of the distribution network because they convert electricity into different voltages to ultimately allow us to power our homes, businesses and enable critical lifeline services.

Electricity substations play a pivotal role during system restoration events, acting as crucial nodes that manage the distribution and regulation of power across the grid. During such events, the efficiency and speed of restoring power are paramount. Manual switching, while a fallback option, is significantly slower and can introduce delays that exacerbate the impact of the outage. Automated systems, on the other hand, can quickly reroute power and restore service, minimising downtime and ensuring a more stable recovery process. This automation reduces the risk of human error and allows for a more coordinated and efficient response.

Moreover, resilient telecommunications links with substations are essential to expedite recovery efforts. These links enable real-time communication and control, allowing operators to monitor the status of the grid and make informed decisions swiftly. In the event of an outage, having robust and reliable communication channels ensures that any issues can be identified and addressed promptly, facilitating a faster restoration of power. This interconnectedness not only enhances the resilience of the power grid but also ensures that critical services and infrastructure can be brought back online with minimal delay, reducing the overall impact on communities.

Role of Distribution Restoration Zones during a Restoration Event

Following an ESR event, there would be a great need for quick and secure supply restoration to the affected parts – or all – of the UK power network. Traditionally, many of the anchor points used to establish initial system generation would be fossil fuel driven Power Stations. In SPD, this role was previously performed by Cockenzie and Longannet and due to the shift in UK strategy to focus on Net Zero targets, these have now been closed and are no longer available to offer the same levels of contribution.

DRZs have been developed, with three zones within SPD initially. DRZs offer restoration options to work in conjunction with the 'top down' method of establishing the Transmission

corridors first, then cascading power down through the Distribution networks. DRZs make use of independent generation providers, strategically placed for connection to the Distribution network. These act as anchor generators, and with pre-determined network switching plans, can develop local power islands. These power islands, once formed, will interact with the SPEN network and provide restoration means, contributing to the NESO targets set out by DESNZ.

System Investment and Consumer Benefits

Investing in our electricity system restoration capabilities offers numerous benefits to consumers, ensuring a reliable and resilient power supply.

It improves reliability, by minimising the duration and frequency of power outages allowing consumers to experience reduced disruption arising from a system restoration event. In addition, electricity is vital for public safety, particularly during emergencies like a system restoration event. A robust restoration system ensures that critical infrastructure, such as hospitals, emergency services, and communication networks, remain operational, protecting lives and property.

Investing in electricity system restoration capabilities is a strategic decision that yields significant benefits for consumers. By ensuring a reliable, safe, and efficient power supply, these investments enhance the quality of life and support economic stability.

Economic Impacts of System Restoration Event

A full or partial shutdown of the electricity network could have significant economic implications. Understanding these impacts is essential to ensure that appropriate preparations are made to mitigate any potential financial consequences.

Labour Costs: The restoration process requires a skilled workforce, including engineers, technicians, and support staff. The costs of overtime, emergency response teams, and specialised contractors can quickly add up.

Business Interruption and Lost Revenue: Businesses, particularly those in manufacturing, retail, and services, can experience significant revenue losses due to power outages. The inability to operate machinery, process transactions, or provide services could lead to decreased productivity and financial losses.

Supply Chain Disruptions: Power outages can disrupt supply chains, affecting the delivery of goods and services. This can lead to delays, increased costs, and reduced efficiency for businesses reliant on timely supplies.

Consumer Spending: Prolonged outages can reduce consumer spending as households prioritise essential needs and cut back on discretionary purchases, negatively impacting local economies, particularly small businesses.

Market Confidence: Frequent or prolonged power outages can erode investor and consumer confidence in the stability of the region's infrastructure. This can lead to reduced investment, slower economic growth, and potential relocation of businesses to more stable areas.

Emergency Services: The public sector incurs significant costs in deploying emergency services, including police, fire, and medical response teams, to manage the impacts of power

outages. These costs can strain municipal budgets and divert resources from other critical areas.

Government Assistance: Governments may need to provide financial assistance to affected businesses and households, including grants, loans, and subsidies. This can increase public expenditure and impact fiscal stability.

Insurance Costs: The frequency and severity of power outages can influence insurance premiums for businesses and households. Higher premiums can increase operational costs and reduce disposable income for consumers.

The economic impacts of an ESR event are multifaceted and far-reaching, effectively demonstrating the need for enhanced infrastructure resilience and modernisation in the electricity grid. By understanding these impacts, we can enhance infrastructure resilience and ensure a swift and efficient restoration process. Investing in preventive measures and robust response plans is essential to minimise the economic burden and support sustainable economic growth.

Our proposed initiatives, as described in section 4 of our re-opener submission, are effective mitigations to these economic risks.

Heathrow Airport Outage

On March 21st, 2025, Heathrow Airport was forced to close for approximately 18 hours due to the loss of their main electrical supply. This was the result of a fire at North Hyde 275 kilovolt (kV) substation near Hayes in West London. The power outage led to the loss of supply to 66,919 customers, including Heathrow Airport and several commercial customers. This led to huge travel disruption to some 1,300 scheduled flights, affecting over 200,000 passengers, with widespread negative publicity across global news. This level of impact in such a small window of time is a reflection on how critical the resilience level of the UK electrical network has become, as we rely so heavily on the power supply throughout day and night, for both domestic and industrial functions.

2.2. Regulatory Requirements

Electricity System Restoration Standard (ESRS)

In April 2021, the Department for Business, Energy and Industrial Strategy (now the Department for Energy Security and Net Zero (DESNZ)) released a Policy Statement[3] setting out the need to strengthen the current regulatory framework by introducing a legally binding target for the restoration of electricity supplies.

In October 2021, DESNZ issued a direction in accordance with Special Condition 2.2 of the NESO Transmission Licence implementing an Electricity System Restoration Standard (ESRS) which requires 60% of electricity demand to be restored within 24 hours in all regions and 100% of electricity demand to be restored within 5 days nationally. The ESRS replaced the previous restoration standard which only required control system resilience at substations etc., for a maximum period of 72 hours.

[3] Introducing a new 'Electricity System Restoration Standard': policy statement - GOV.UK

This new ESRS requires NESO to have sufficient capability and arrangements in place to fulfil these requirements reducing restoration time across the UK and ensuring a consistent approach across all regions.

Consequently, the NESO proposed several changes to the grid code and distribution code to facilitate the requirements of the ESRS, which were subsequently approved by Ofgem on 5th February 2024.

Grid Code (GC) GC0156

Grid Code (GC) GC0156: Facilitating the implementation of the Electricity System Restoration Standard[4], sets out the resilience requirements on Generators, Restoration Contractors, Transmission Network Owners (TOs), Distribution Network Operators (DNOs) and the Electricity System Operator (ESO) and the specific processes and requirements necessary for them to implement to meet the ESRS.

At a high level, these include requirements related to the controllability and availability (resilience requirements) of network assets in the event of a Partial or Total shutdown. Additionally, GC0156 includes provisions relating to co-ordination between relevant parties in designing and implementing Restoration Plans, and subsequent expansion of a Power Island formed under such plans.

Specific amendments to the grid code arising from GC0156 include:

- PC.A.5.7.2 – annual submission of information on the status of the DZRP.
- OC5.7.2.6 – introduction of a DNO duty to undertake Distribution Restoration Zone control systems tests.
- OC9.4.7.4 – a requirement that DNOs in Scotland will be responsible for the operation of relevant Distribution restoration zones now that Distribution Restoration Zone Plan (DRZP) agreements are in place between SPEN and the NESO.
- CC.6.4.5.2(c) – provision of secure, robust, and power resilient communications system.
- CC.7.10.4 – the functional requirements of the Distribution Restoration Zone Control System shall be in accordance with the control telephony electrical standard and distribution restoration zone control system high level functional requirements.
- CC.7.10.7 – ensuring that control systems, communications systems, and telemetry systems are sufficiently robust and reliable during system restoration.

Distribution Code DCRP/MP/22/02

Distribution Code DCRP/MP/22/02: Electricity System Restoration Standard and Distributed Restart [5]introduces a bottom-up system restoration approach, building on the developments of the Network Innovation Competition Distributed ReStart project.

DCRP/MP/22/02 added several Distribution Code definitions associated with system restoration and the replacement of all references to 'Black Start' with 'electricity system restoration' to align the terminology to the ESRS policy statement.

[4] Grid Code GC0156: Facilitating the implementation of the ESRS
[5] Distribution Code Modification DCRP_MP_22_02 Authority Decision

It also proposes amendments to relevant sections of the Distribution Code to introduce the concept of Distribution Restoration Zone Plans (DZRP) and allow capable Generators to participate in a DZRP. It codifies the high-level requirements to enable Distribution Restoration, including the development, review, and implementation of DZRPs.

Our Licence Compliance

Standard Licence Condition (SLC) 20 within our Distribution licenses require us to comply with the Grid Code and Distribution Code. In addition, SLC 20.4 specifically requires that we must take all reasonable steps to secure and implement consequential changes to the Codes. GC0156 and DCRP/MP/22/02 are consequential changes.

Eligibility of our Re-opener Application

We are submitting this re-opener application in accordance with the overarching requirements of Special Licence Condition 3.2 (Uncertain Cost Re-openers) and Special Licence Condition 3.2 (Part C) Electricity System Restoration Re-opener. Special Condition 3.2.21 sets out that this re-opener may be used where there has been a change to the Electricity System Restoration Scope of Work, and we expect to incur additional costs associated with this change. The Electricity System Scope of Work is defined in Special Condition 1.2 of our Electricity Distribution Licence. It means the 'scope of work' that the licensee has agreed to undertake to assist the GB System Operator (NESO) to meet its obligations to comply with the target Restoration Times that the Secretary of State has directed the GB System Operator to have the capability to meet.

The new ESRS is the catalyst for the change to the ESR Scope of Work, with the Grid Code and Distribution Code changes referenced above, and approved by Ofgem, providing further detail on the new requirements on DNOs. After extensive analysis, we have identified a suite of 7 initiatives, which when combined, will allow us to comply with the Code changes.

We have engaged with the NESO extensively on the services they need to establish and comply with the new ESRS. They agree that our proposed investment programme as described in this re-opener submission will support them in their obligations to comply with Restoration Times they will be required to meet. NESO have provided 2 separate letters of support to our proposed asset resilience (Initiatives 1 – 3) and DRZ (Initiatives 4 – 6) investments.

We therefore believe this demonstrates that it is appropriate to use the ESR re-opener to apply for funding for the proposals contained within this submission.

Further detail of our stakeholder engagement can be found in section 3.4.

ESRS Submission Timescale

The original submission date for the ESR re-opener was between 24 – 28 June 2024.

However, Ofgem issued a direction under Special Licence Condition 3.2.22 to create 2 additional Re-opener application windows to allow licensee to apply for Electricity System Restoration (ESR) Re-opener allowances.

Ofgem directed the following additional Re-opener application windows for each electricity distribution licensee:

- Between 23 June 2025 and 27 June 2025; and
- Between 21 June 2027 and 25 June 2027.

2.3. Approach to this Re-opener Application

ED2 Commitments and ESRS Uncertainty

Uncertainty around the targets included in ESRS at the time of our RIIO-ED2 business plan[6] submission meant a comprehensive investment plan for system restoration that fully reflected the new ESRS and Code requirements could not be submitted at that time.

However, in anticipation of the new ESRS, our RIIO-ED2 plan set out that we would increase the network and telecoms resilience of core and critical substations to 5 days from the 72 hours standard that was still mandated at that time. This means that during ED2, we will invest £5.820m (using agreed RIIO-ED2 allowance) in Electricity System Restoration activities to build a network which is resilient to a total or widespread loss of power on the GB electricity network. During RIIO-ED2, we will achieve full resilience for all core and critical substation locations. Core and critical site lists are maintained by SPEN's Operational Control Centre and are consistent with the Protected Sites List (PSL) as defined under the Electricity Supply Code, and Primary Substations in the SPM licence that are listed within the Local Joint Restoration Plan (LJRP). This is detailed in SPEN's RIIO-ED2-NLR(A)-SPEN-001-RES-EJP Electricity System Restoration (ESR), and RIIO-ED2 Business Plan Annex 4A.17: Electricity System Restoration Strategy.

Since then, ESRS requirements have been confirmed and there has been clarity from our engagement with NESO on how SPEN can help support their compliance with ESRS. The scope of ESRS is broader than just core and critical substations. Consequently, SPEN intend to use the June 2025 re-opener window to submit additional plans for work to be completed by the end of RIIO-ED2.

We do not intend to submit a further request at the ESR Re-opener window in June 2027 unless delivery capabilities change. The remainder of the work required to support NESO compliance will be submitted in our RIIO-ED3 submission.

Tools Used to Inform our Optioneering

Options were considered within each area of this submission, with a chosen option identified and then expanded to provide further detail and justification. Consideration was given to:

- RIIO-ED2 plan EJPs, volumes and costs
- Previous delivery rates
- Stakeholder engagement with our internal licence areas
- Framework contractor services and rates
- Data gathering on existing assets, capacities and resilience levels
- Approved technologies which prevent early asset replacement

[6] SPEN RIIO-ED2 Final Business Plan - 1st December 2021 - FINAL.pdf

2.4. Options Selection Methodology and Assessment Approach

This section explains the methodology used to assess the options, and the criteria used to select the preferred option. The methodology follows paragraph 3.13 of Ofgem's Re-opener Guidance and Application Requirements document.

Each initiative details the options considered, including a do nothing and do minimum option. It also describes how the options have been selected, assessed, and selected based on the relevant criteria (meeting the objective of initiative and cost). An associated Cost Benefit Analysis (CBA) has been carried out for 6 of the 7 initiatives, including sensitivity analysis.

In general, our approach has been to select a credible range of options for each initiative - these are based on our experience, stakeholder engagement, and internal subject matter experts.

Section 4 provides a breakdown for each initiative.

3. Needs Case and Structure of our Submission

To avoid repetition, we have structured the detailed needs case for our 7 initiatives into three themes.

- **Enhanced Network Asset Resilience** – Our assets need to be capable of supporting the NESO to restore 100% of national demand within five days, if the need arises. One way in which our network could be used to support system recovery is set out within the Local Joint Restoration Plan (LRJP)[7], and our assets need to have a minimum of 120 hours of resiliency to allow them to be called on if needed at any point within that five-day window. A network of assets that are resilient and remotely operable, provides a high level of flexibility when restoration plans are required, and removes the reliance on manual response, coordination and operation, fulfilling SPEN's duty as a DNO to support the NESO in their response targets to restore the UK demand. The investment required to enhance our critical asset resilience is outlined in initiatives 1, 2, and 3.
- **Establishment of Distribution Restoration Zones** – In the event of a full or partial system shut down, there must be a source or 'anchor' point where electricity is generated, during a system restoration event, to establish a Distribution Restoration Zone (DRZ) and growth of a Local Power Island. From that source, electricity then travels through the network connecting the Distribution and Transmission systems. Our distribution network has a new role in this process as we are responsible for the operation of relevant Distribution Restoration Zones, as opposed to a more traditional, inflexible approach of 'top down' restoration. The new investment required to fulfil this role is outlined in initiatives 4, 5 & 6.
- **Supporting resources –** Additional staff resources are required to deliver the required investment so that the right workforce is in place to ensure successful delivery of our proposed network resilience and DRZ initiatives across the different phases in the lifecycle of each proposed measure: Delivery, Operation and ongoing Assurance. The investment required is outlined in initiative 7.

As a DNO we are also required to perform various critical actions during the system restoration procedure. These responsibilities include, but are not limited to, providing power corridors under the Local Joint Restoration Plan (**LJRP**) and operationalising a Distributed Restoration Zone Plan (**DRZP**) to support a safe and stable restoration.

To enable the effective delivery of these duties, appropriate network infrastructure and staff resources must be in place to meet stringent restoration targets required by the ESRS. SPEN's

[7]**The LRJP is an agreement between NESO, TOs & DNOs.** DNOs play a crucial role in the delivery of the local joint restoration plan, ensuring the swift and efficient restoration of electricity supply following disruptions. This involves a range of activities aimed at maintaining grid stability, prioritising efficient resource allocation, providing accurate information about outages and restoration, coordinating with stakeholders, and safeguarding public safety.

role in this framework is crucial for maintaining the resilience and reliability of the electricity supply during such critical events.

3.1. The Needs Case for Asset Resilience

As outlined above, to successfully support the ESRS goal of restoring 100% of national demand within 5 days (120 hours) we need to ensure that critical assets that are required to support system recovery have a minimum of 120 hours resilience.

In the event of an electricity system shutdown, as the NESO moves towards satisfying their ESRS role, SPEN has an obligation to ensure that our substations can be called upon by the NESO at any point during the 5-day window to help energise the overall GB network. For this to happen, the NESO agrees with our analysis that we need to invest in:

- back-up generators and battery systems to provide an alternative power supply for the full duration of the system restoration period (5 days) enabling the substation to be operated remotely.
- black start controllers to ensure that all non-essential load on the site is disconnected, preserving the battery capacity until it is again required (once network restoration is taking place); and
- telecommunications assets to have at least 5 days resilience through the provision of batteries and generators to remove the reliance on manual intervention at substations enabling them to be operated remotely.

Initiatives 1, 2 and 3 as described in Section 4 are required to fulfil network resilience requirements arising from the ESRS.

The SPEN network already has an inherent level of asset resilience. However, as a restoration event timeline progresses there is greater reliance on manual intervention rather than remote intervention, which could extend the time required to restore customers off supply. To reduce the reliance on manual intervention, SPEN will work towards upgrading all network and telecommunications assets, at grid and primary substations to have at least 5 days of resilience (an initiative supported by NESO through a Letter of Support).

Network Asset Resilience Analysis

To assess the existing capacity of our asset resilience, data has been collected and analysed to evaluate battery capacity for telecoms infrastructure, power supply at primary substations, protection relay types, and circuit breaker panels at primary and grid substations. Using the available datasets, we have calculated energy consumption and estimated the current battery capacity at each site, providing each with a resilience level in hours. This will be used to prioritise our proposed actions into delivery.

3.2. The Needs Case for DRZ

In the event of a full or partial system shut down, there must be a source, or ‘anchor’ point, where electricity is generated. From that source it travels through the network connecting the various points outlined in the LRJP. For many years, within our SP Distribution licence area, the key anchor points were Cockenzie and Longannet Power Stations. However, following the

closure of the Cockenzie and Longannet Powers Stations, a new approach was co-developed between SPEN and the NESO to utilise Distributed Energy Resources to create 3 DRZs in Central Scotland, Fife, and Dumfries and Galloway. Without adoption of these DRZs, the electricity network in South or Central Scotland would not be able to be restarted without the support of anchor plant/network operators outside SPD.

The DRZ concept follows on from the Innovation Project 'Distributed Restart' where SPEN & the ESO worked together to demonstrate using DERs such as wind, BESS and solar to re-energise the Grid and supply load. A DRZ is turning this innovation into a practical, business as usual scheme. On completion of these 3x DRZ schemes, the SPEN network will have the capability to restore 1m customers (approximately 500k services), without relying on a Transmission supply, within 24hrs of an ESR event. This helps reduce the overall restoration time for the UK and provides power islands which then aid the Transmission Network returning to being fully operational.

Distributed ReStart

Between 2019-2022, Distributed ReStart[8] explored how DERs (generators connected to the Distribution Networks) can be used to restore power to the Transmission Network, introducing the concept of a Distribution Zone Restoration Plan (DZRP).

DZRPs are similar to the existing top-down restoration approaches implemented via Local Joint Restoration Plans (LJRPs). They involve DNOs using distribution connected Restoration Contractor plant to energise sections of their Network as defined within the DZRP, under the instruction of the System Operator. It is envisioned that DZRPs would run in parallel to LJRPs to facilitate system restoration as fast as possible.

Distributed ReStart Live trials

Live trials[9] of the DZRP concept were successfully completed within Dumfries and Galloway, and the Glenrothes area in Fife. This successfully demonstrated that the Distributed ReStart project has led to the development of clear and detailed information to understand how DERs can be used to restore power in the highly unlikely event of a total or partial shutdown of the national electricity transmission system (NETS) and how Distributed ReStart can be applied on distribution networks.

Distribution Restoration Zones (DRZ)

SPEN worked closely with NESO through the Northern Tender process to award ESR Response contracts identifying which potential generators would be suitably placed electrically to develop Distribution Islands. This resulted in the identification of 3 Distribution Restoration Zones (DRZ) on the SPD Network.

SPEN's DRZs are a key part of the future of the grid. These zones, which follow the concept of the Distributed Restart project, aim to use low-carbon technologies like wind, battery energy storage systems (BESS), and solar to restore power to areas that may be off-grid following a

[8] Distributed ReStart | National Energy System Operator
[9] Distributed ReStart – Redhouse Live Trial | ENA Innovation Portal

system restoration event, enhancing the resilience of the electricity grid by enabling localised power restoration during outages.

The SPEN DRZs will utilise the 132kV network to expand the demand. The 132kV Network within SPEN is a SPT asset, but additional works are required to be undertaken within the 132kV network to facilitate the DRZ operation. These works (and associated costs and volumes) were included within the SPT RIIO-T3 Submission.

The 3 proposed SPEN DRZs are shown below.

Diagram of Central and Fife DRZs

Diagram of Dumfries and Galloway DRZ

3.3. The Needs Case for Staff Resources

Staff resources, with appropriate skills, are required to:

Support delivery of asset resilience upgrades and DRZ (Indirects)

Delivery support is required to ensure asset resilience upgrades (outlined in EJPs 001 – 003) and DRZ deployment (outlined in EJP 004 – 006) are delivered on time and in budget.

SPEN propose to reflect the Indirects Scalar outlined by Ofgem in Section 6.84 of the RIIO-ED2 Final Determination Overview Document for use in load-related uncertainty mechanisms within RIIO-ED2. This scalar, set at 10.8%, is an automatic mechanism for varying Closely Associated Indirect (CAI) costs associated with the Secondary Reinforcement volumes driver, LV Services volume driver, and the overall the Load-Related Expenditure (LRE) reopener. Given that the proposed interventions within this reopener will also affect CAIs, we believe that applying the 10.8% scalar to Initiatives 1 - 6 is also justified.

Operate DRZ in ESR scenario

In an ESR event, each DRZ (3 in total) will require to be established and operated as separate island networks, each requiring the island operator(s) to co-ordinate the creation and expansion of the network island and the real time balance of generation and demand to maintain system frequency and voltage within statutory limits.

Support ESR assurance requirements

The establishment of dedicated resources for ESR planning and assurance, including the proposed Assurance Manager and Lead Engineer Coordinators, is crucial for ensuring the resilience of the electricity network and meeting regulatory requirements under the ESRS. The responsibilities associated with these roles—ranging from regulatory reporting and coordination of exercises to real-time operational management—demand specialized knowledge, operational expertise, and consistent attention to detail. By allocating dedicated resources with the necessary network knowledge, operational experience, and asset management expertise, the company will be better positioned to ensure ESR readiness and compliance, safeguarding the electricity network and supporting its swift recovery in the face of disruption.

3.4. Stakeholder Engagement

Asset Resilience

NESO

SPEN has engaged with the NESO throughout our preparations for this ESR Re-opener submission. We have discussed our understanding of the re-opener justification and the relationship between the ESRS and code compliance, our proposed actions requiring further investment, and plans for delivery in the ED2 period and into the next price control. These have

been met with full agreement and support from NESO. Please refer to NESO Letter of Support for more detail.

Ofgem

In accordance with the re-opener guidance, SPEN has undertaken pre-application engagement with Ofgem. This included an initial engagement meeting held by SPEN in March 2025, where Ofgem representatives were taken through our submission proposal, covering the structure of the documents and the actions identified for further investment. Ofgem raised no issues with the proposals and stated that a detailed assessment would be made after the submission.

Independent Net Zero Advisory Committee

In preparation for the ESR Re-opener, we engaged with our Independent Net Zero Advisory Committee (INZAC) to gather their feedback.

Established in 2022, INZAC brings together 15 external experts to provide insights and challenges to help SPEN Net Zero goals.

INZAC were fully supportive of the submission plans. Please see INZAC Letter of Support for more detail.

RIIO-ED2 Customer and Stakeholder Engagement

As part of the RIIO-ED2 business plan submission, robust stakeholder engagement was undertaken to identify customer priorities and gain insights from key stakeholders. This is outlined in our Annex 3.2a Stakeholder Engagement from RIIO-ED2 submission. This engagement ensured that our business plans reflected the views and needs of all customers and stakeholders. This feedback has been considered throughout the development of this re-opener submission, to ensure proposals remain in line with these expectations and with our RIIO-ED2 baseline strategies.

Our customer feedback highlighted the following:

a) “Network resilience, not having a power cut” was ranked the second most important priority by both domestic and commercial customers. Resilience of supply is extremely important to customers, especially for those over 70 or who are classed as vulnerable.

b) In relation to customer service, domestic and commercial customers also highlighted that network resilience was a priority, specifically highlighting service continuity/disruption, speed of restoration and avoidance of power disruptions as critical areas of focus.

Distribution Restoration Zones

NESO

SPEN has engaged with NESO from the outset to develop the concept of a DRZ. Moving this to a BAU deliverable required the NESO tendering process to be reviewed with SPEN to ensure the potential ESR Generation contracts could in fact work technically to deliver a DRZ. As the DRZ concept develops SPEN is in frequent contact to determine the technical requirements to integrate/access the NESO systems to allow a set of SPD power Islands to be created and controlled.

NESO provided a specific Letter of Support for the DRZ element of the submission. Please refer to NESO DRZ Letter of Support for more detail.

Ofgem

SPEN has been in discussion with Ofgem on the size and scale of the DRZs from the outset. The proposal from SPEN puts DRZs as one of the main instruments required to deliver the ESRS legal requirements. SPEN has been working with Ofgem to demonstrate how Ofgem funded innovation (i.e. Distributed Restart) can be turned into business as usual at a scale which significantly impacts how electricity system restoration is achieved.

Independent Net Zero Advisory Committee

In preparation for the ESR Re-opener, we engaged with our Independent Net Zero Advisory Committee (INZAC) to gather their feedback.

Established in 2022, INZAC brings together 15 external experts to provide insights and challenges to help SPEN Net Zero goals.

INZAC were fully supportive of the submission plans. Please see INZAC Letter of Support for more detail.

ESR Contracted Generators

As part of the works with NESO, the condition requirements for a DRZ to be able to be created were an Anchor Generator (one that could start the network without any external requirements) and a Top Up Generator (one that would be available to support the initial re-energised network quickly after it had been requested). On award of the ESR Generation contracts (both Anchor and Top-up) SPEN have undertaken regular meetings (also with NESO) with all the parties involved in the proposed DRZs. These meetings have been pivotal in helping move innovation to business as usual by interacting with the different generators and control systems. The meetings have developed and presented the understanding of the DRZ concept within SPD and helped develop a system that will become standard for future DRZs.

4. ESR Re-opener Programme Initiatives

Our ESR investment programme for this re-opener application has been split across 7 distinct initiatives:

Asset Resilience

Initiative 1 - 132kV Network Resilience

Initiative 2 - Primary Substations Network Resilience

Initiative 3 - Substation Telecommunications resilience

Distribution Restoration Zones

Initiative 4 – Distribution Restoration Zone (Central Scotland)

Initiative 5 – Distribution Restoration Zone (Dumfries & Galloway)

Initiative 6 – Distribution Restoration Zone (Fife)

ESRS Resources

Initiative 7 - Staff resources

A brief description of each of these initiatives is provided below. For more detailed information including detailed costs breakdown and options assessment please refer to relevant EJPs/CBAs.

4.1. 132kV Substation Network Resilience

Initiative 1 aims to improve the resilience of 132kV network within SPM, to reduce reliance on manual intervention during an ESR event. This work will enable the SPM network to play a key role in establishing initial, local Power Islands in line with the NESO restoration strategy, before providing interconnection to support Regional Restoration Plans. Additionally, using generators to achieve resilience will retain security of substations and provide power supplies for operational staff hubs during an ESR event. Ultimately, this will help support NESO with its requirement to achieve ESRS.

Over the RIIO-ED2 period so far, we have begun to increase the resilience of core and critical substations. To continue our journey to establishing a resilient network, and in addition to continuing BAU activities previously approved by Ofgem throughout the remainder of the RIIO-ED2 period, we propose to increase network resilience at a proportion of SPM's 132KV substations to 5 days, by installing back-up generator sets at each location.

This investment will install generators at 14x 132kV substation sites which have <120 hours of resilience. Work will be carried out at the sites with lowest resilience.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-001-EJP 132kV Substation Network Resilience.

Options Considered

The following options were considered with Option 1 (Do Minimum) chosen.

Table 2 – Initiative 1 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Continue to replace existing batteries and generators like-for-like as per current replacement programme.	Rejected	This option does not reduce the need to manually intervene in an ESR event (and support NESO achieve ESRS). Ability to remotely intervene for the duration of an ESR event is supported by NESO (through a Level of Support).
Option 1 (Do Minimum) – Generators & Battery Upgrade combination	Install Generator set at all 132kV Substations currently under 120 hours resilience, unless calculations identify minor battery upgrade work will ensure present and future compliance.	**Adopted**	Initial high cost to procure and install generator sets but a longer life cycle for these assets, also provides future comfort as the load capacity is far greater – this provides the full resilience cover operationally (including telecoms) as well as enhanced services such as power supply for operational staff hubs during any event. This brings SPM 132kV sites in line with SPT Grid Substations.
Option 2 – Battery System	Replace and upgrade the existing battery charger and install additional battery capacity to reach 120 hours.	Rejected	Initial lower cost however, expected 10yr lifecycle for batteries often mean replacing in a large scale, physical space is an issue at many sites, careful calculations required to cover load and future loading uncertain.

Option 3 – Batteries & Controller	Install additional batteries and controller at sites of less than 120 hours resilience.	Rejected	The critical nature of 132kV Substation sites and the role they play in the wider UK restoration plans mean they must be fully visible and operational throughout the 120hr period, so the full load of the site is to remain on back up supply.

A CBA was carried out which showed a positive NPV in comparison to Baseline (Do Nothing) approach. Sensitivity analysis was undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 1 still has a large positive NPV. For more detailed information on this, please refer to ED2-ESRR-SPEN-001-CBA 132kV Substation Network Resilience.

Our Proposed Investment

We are seeking to implement the following investment.

Table 3 – Initiative 1 Proposed Investment

Investment	Description	Benefit
Generator & Battery Upgrade	Install generators at 132kV SPM substations currently under 120 hours resilience.	Reduces reliance on manual intervention, retains security of substations and provides power supplies for operational staff hubs during any ESR event. This will help support NESO with requirement to achieve ESRS. No drawbacks have been identified however it has been recognised as this option presents a higher unit cost than other options analysed.

Additional costs arising from this investment

Total Cost	£ 3.904m

4.2. Primary Substation Network Resilience

Initiative 2 aims to increase the resilience of the primary substation network to reduce the reliance on manual intervention during an ESR event, supporting NESO with its requirement to achieve ESRS.

Over the RIIO-ED2 period so far, we have begun to increase the resilience of core and critical substations. To continue our journey to increase the resilience of our network, we propose to invest at a proportion of SPD/SPM primary substations to provide a minimum of 5 days resilience.

This investment will install 61 battery/controller systems and 14 blackstart controllers in SPD and install 111 battery/controller systems and 49 blackstart controllers in SPM. Work will be carried out at the sites with lowest resilience, aligned with network and customer criticality.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-002-EJP Primary Substation Network Resilience.

Options Considered

The following options were considered with Option 3 (Do Minimum) chosen.

Table 4 – Initiative 2 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Continue to replace existing batteries and generators like-for-like as per current replacement programme.	Rejected	This option does not reduce the need to manually intervene in an ESR event (and support NESO achieve ESRS). Ability to remotely intervene for the duration of an ESR event is supported by NESO (through a Level of Support).
Option 1 – Generators Only	Achieve 120 hours resilience through use of generators.	Rejected	This option achieves requirement however it is more expensive than the other options that meet the requirements (Option 2 and Option 3). It has therefore been rejected.
Option 2 – Batteries Only	Achieve 120 hours resilience through use of batteries.	Rejected	This option achieves requirement however it is more expensive than Option 3. It has therefore been rejected.
Option 3 (Do Minimum) **–** Batteries & Blackstart Controllers	Achieve 120 hours resilience through use of batteries and battery/controller systems.	**Adopted**	This option achieves requirements with the lowest cost of the options considered.

A CBA was carried out which showed that Option 3 was the most favourable option (highest NPV). Sensitivity analysis was undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 3 would still be the preferred option. For more detailed information on this, please refer to ED2-ESRR-SPEN-002-CBA Primary Substation Network Resilience.

Our Proposed Investment

We are seeking to implement the following investment.

Table 5 – Initiative 2 Proposed Investment

Investment	Description	Benefit
Battery/ Charger System & Controllers	Install upgraded battery/charger systems and black start controllers at SPD/SPM primary substations which are currently under 120 hours resilience.	Reduces reliance on manual intervention during an ESR event, reducing time to restore power. This will help support NESO with requirement to achieve ESRS. No drawbacks have been identified with this option.

Additional costs arising from this investment

Total Cost	£ 5.998m

4.3. Substation Telecommunications Resilience

Initiative 3 aims increase the telecommunications resilience at 132kV substation and primary substations on the network to reduce the reliance on manual intervention during an ESR event, supporting NESO with its requirement to achieve ESRS.

Over the RIIO-ED2 period so far, we have begun to increase the resilience of core and critical substations. To continue our journey to increase the resilience of our network, we propose to invest the majority of SPD/SPM primary substations will <120 hours telecommunication resilience.

This programme of work will upgrade 73 batteries and install 267 batteries at SPD substations and upgrade 16 batteries and install 392 batteries at SPM substations. Work will be carried out at the sites with lowest resilience, taking into account criticality.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-003-EJP Substation Telecommunications Resilience.

Options Considered

The following options were considered with Option 3 (Do Minimum) chosen.

Table 6 – Initiative 3 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Continue to replace existing batteries and generators like-for-like as per current replacement programme.	Rejected	This option does not reduce the need to manually intervene in an ESR event (and support NESO achieve ESRS). Ability to remotely intervene for the duration of an ESR event is supported by NESO (through a Level of Support).
Option 1 – Generators Only	Achieve 5 days resilience through installation of generators.	Rejected	This option achieves requirement however it is more expensive than the other options that meet the requirements (Option 2 and Option 3). It has therefore been rejected.
Option 2 – Batteries Only (Replace)	Achieve 5 days resilience through replacement of batteries.	Rejected	This option achieves requirements however it is more expensive than Option 3. It has therefore been rejected.
Option 3 (Do Minimum) – Batteries Only (Replace and Upgrade When Feasible)	Achieve 5 days resilience through replacement of batteries (and upgrade of batteries when feasible).	**Adopted**	This option achieves requirements with the lowest cost of the options considered.

A CBA was carried out which showed that Option 3 was the most favourable option (highest NPV). Sensitivity analysis has been undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 3 would still be the preferred option. For more detailed information on this, please refer to ED2-ESRR-SPEN-003-CBA Substation Telecommunications Resilience.

Our Proposed Investment

We are seeking to implement the following investment.

Table 7 – Initiative 3 Proposed Investment

Investment	Description	Benefit
Install & upgrade batteries at the majority of SPM grid, SPD primary and SPM primary substations	Install & upgrade (when feasible) batteries at 132kV and primary substations which are currently under 120 hours resilience.	Reduces reliance on manual intervention during an ESR event, reducing time to restore power. This will help support NESO with requirement to achieve ESRS. No drawbacks have been identified with this proposed option.

Additional costs arising from this investment

Total Cost	£ 8.294m

4.4. DRZ – Central Scotland

Initiative 4 will deliver the required investment within the Central Area to support the establishment of a Distributed Restart Zone (DRZ) and growth of a Distributed Island within the Central area following a system restoration event.

Contracts have been placed between NESO, SPEN and both Anchor & Top Up providers to establish the DRZ. SPEN must now provide a network that can support these contracts and re-establish the network beyond to restore customers under a system restoration event. To that end SPD requires investment in the 33kV & 11kV systems to establish a network that can support a bottom-up restoration rather than the traditional (and now obsolete) top-down process. This requires upgrade of equipment to support both full SCADA Telecontrol, and protection upgrades to allow a safe network restoration process.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-004-EJP Project REPOWER Central Zone.

Options Considered

The following options were considered with Option 2 chosen.

Table 8 – Initiative 4 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Utilise existing system and not support the DRZ	Rejected	Rejected as it would be a breach of Licence Obligations.

Option 1 (Do Minimum) – Generators Only	Invest to ensure that Anchor Generator site can connect to Top Up Generators	Rejected	This would be the minimum requirement to create a DRZ, by connecting contracted generation together. This however would only allow access to Approx 60MW of generation which would only support the connection of approx. 23,000 customers. To operate and maintain this under an NPO would be a time-consuming resource heavy requirement and would not allow the GC0156 Targets to be met.
Option 2 – Full Scale DRZ as detailed in EJP	Deploy all the optioneering technical works as detailed in EJP	**Adopted**	The proposed scheme connects the contracted generation, but also allows expansion and access to non-contracted generation allowing the growth of the island, this island growth is essential for security, stability and restoration of demand to deliver the legal requirement of GC0156.

A CBA was carried out which showed a positive NPV in comparison to Baseline (Do Nothing) approach. Sensitivity analysis was undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 2 still has a large positive NPV. For more detailed information on this, please refer to ED2-ESRR-SPEN-004-CBA REPOWER Central Zone.

Our Proposed Investment

We are seeking to implement the following investment.

Table 9 – Initiative 4 Proposed Investment

Investment	Description	Benefit
Earthing Transformer	Install Earthing Transformer to the anchor Gen 33kV BB.	Provides an earth when required during the establishment of the DRZ.
33kV Switchgear	Install new 33kV SWGR across strategic locations.	Allows the creation of a network that supports interconnected running and flexibility to adapt to any issues as the DRZ is developed.

Targeted strategy of Standards across sites	Install communications equipment required to support the DRZ Robust resilient communications are required for the support and delivery of the DRZ.	Ensures that performance and resilience meet the requirement for each site. Comms are essential to provide remote control via SCADA and the protect communications for safe system operation.
DRZ Controllers	DRZ controllers allow the island to be created and maintained by balancing demand and generation.	Installation of the DRZ Controller allows the safe, stable establishment of the distributed island managing load / generation/ voltage and frequency in real time

Additional costs arising from this investment

Total Cost	£14.975m

4.5. DRZ – Dumfries & Galloway

Initiative 5 will deliver the required investment within the Dumfries & Galloway to support the establishment of a Distributed Restart Zone (DRZ) and growth of a Distributed Island within Dumfries & Galloway following a system restoration event.

Contracts have been placed between NESO, SPEN and both Anchor & Top Up providers to establish the DRZ. SPEN must now provide a network that can support these contracts and re-establish the network beyond to restore customers under a system restoration event. To that end SPD requires investment in the 33kV & 11kV systems to establish a network that can support a bottom-up restoration rather than the traditional (and now obsolete) top-down process. This requires upgrade of equipment to support both full SCADA Telecontrol, and protection upgrades to allow a safe network restoration process.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-005-EJP Project REPOWER Dumfries & Galloway Zone.

Options Considered

The following options were considered with Option 2 chosen.

Table 10 – Initiative 5 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Utilise existing system and not support the DRZ	Rejected	Rejected as it would be a breach of Licence Obligations
Option 1 (Do Minimum) – Generators Only	Invest to ensure that Anchor Generator site	Rejected	This would be the minimum requirement to create a DRZ, by connecting

	can connect to Top Up Generators		contracted generation together. This however would only allow access to Approx 40MW of generation which would only support the connection of approx. 10,000 customers. To operate and maintain this under an NPO would be a time-consuming resource heavy requirement and would not allow the GC0156 Targets to be met.
Option 2 – Full Scale DRZ as detailed in EJP	Deploy all the optioneering technical works as detailed in EJP	**Adopted**	The proposed scheme connects the contracted generation, but also allows expansion and access to non-contracted generation allowing the growth of the island, this island growth is essential for security, stability and restoration of demand to deliver the legal requirement of GC0156.

A CBA was carried out which showed a positive NPV in comparison to Baseline (Do Nothing) approach. Sensitivity analysis was undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 2 still has a large positive NPV. For more detailed information on this, please refer to ED2-ESRR-SPEN-005-CBA REPOWER D&G Zone.

Our Proposed Investment

We are seeking to implement the following investment.

Table 11 – Initiative 5 Proposed Investment

Investment	Description	Benefit
11kV Switchgear	Install new 11kV Switchgear across strategic locations.	Allows the creation of a network that supports interconnected running and flexibility to adapt to any issues as the DRZ is developed.
Targeted strategy of Standards across sites	Install communications equipment required to support the DRZ Robust resilient communications are required for the support and delivery of the DRZ.	Ensures that performance and resilience meet the requirement for each site. Comms are essential to provide remote control via SCADA and the protect communications for safe system operation.

DRZ Controllers	DRZ controllers allow the island to be created and maintained by balancing demand and generation.	Installation of the DRZ Controller allows the safe, stable establishment of the distributed island managing load / generation/ voltage and frequency in real time.

Additional costs arising from this investment

Total Cost	£3.940m

4.6. DRZ - Fife

Initiative 6 will deliver the required network investment within the Fife Area to support the establishment of a Distribution Restoration Zone (DRZ) and growth of a Distributed Island within the Fife area following a system restoration event.

Contracts have been placed between NESO, SPEN and both Anchor & Top Up providers to establish the DRZ. SPEN must now provide a network that can support these contracts and re-establish the network beyond to restore customers under a system restoration event. To that end, SPD requires investment in the 33kV & 11kV systems to establish a network that can support a bottom-up restoration in tandem with the traditional top-down, LJRP process. This requires upgrade of equipment to support both full SCADA Telecontrol, and protection upgrades to allow a safe network restoration process.

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-006-EJP Project REPOWER Fife Zone.

Options Considered

The following options were considered with Option 2 chosen.

Table 12 – Initiative 6 Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing. Utilise existing system and not support the DRZ	Rejected	Rejected as it would be a breach of Licence Obligations
Option 1 (Do Minimum) – Generators Only	Invest to ensure that Anchor Generator site can connect to Top Up Generators	Rejected	This would be the minimum requirement to create a DRZ, by connecting contracted generation together. This however would only allow access to Approx 60MW of generation which would only support the connection of approx. 17,000

			customers. To operate and maintain this under an NPO would be a time-consuming resource heavy requirement and would not allow the GC0156 Targets to be met.
Option 2 – Full Scale DRZ as detailed in EJP	Deploy all the optioneering technical works as detailed in EJP	**Adopted**	The proposed scheme connects the contracted generation, but also allows expansion and access to non-contracted generation allowing the growth of the island, this island growth is essential for security, stability and restoration of demand to deliver the legal requirement of GC0156.

A CBA was carried out which showed a positive NPV in comparison to Baseline (Do Nothing) approach. Sensitivity analysis was undertaken to assess the impact of fluctuations in prices (10% increase and 10% decrease). In both cases, Option 2 still has a large positive NPV. For more detailed information on this, please refer to ED2-ESRR-SPEN-006-CBA REPOWER Fife Zone.

Our Proposed Investment

We are seeking to implement the following investment.

Table 13 – Initiative 6 Proposed Investment

Investment	Description	Benefit
Earthing Transformer	Install Earthing Transformer to the anchor Gen 33kV BB.	Provides an earth when required during the establishment of the DRZ.
33kV Switchgear	Install new 33kV SWGR across strategic locations.	Allows the creation of a network that supports interconnected running and flexibility to adapt to any issues as the DRZ is developed.
Targeted strategy of Standards across sites	Install communications equipment required to support the DRZ Robust resilient communications are required for the support and delivery of the DRZ.	Ensures that performance and resilience meet the requirement for each site. Comms are essential to provide remote control via SCADA and the protect communications for safe system operation.

DRZ Controllers	DRZ controllers allow the island to be created and maintained by balancing demand and generation.	Installation of the DRZ Controller allows the safe, stable establishment of the distributed island managing load/ generation/voltage and frequency in real time.

Additional costs arising from this investment

Total Cost	£18.925m

4.7. Staff Resources

Initiative 7 requires staff resources, with appropriate skills, to:

1. Support delivery of asset resilience upgrades and DRZs, as outlined in EJPs 001 – 006 (Indirects)
2. Operate DRZs in an ESR scenario
3. Support ESR assurance requirements

For more detailed information on this proposal please refer to ED2-ESRR-SPEN-007-EJP Additional Resources.

Options Considered

Delivery of Asset Resilience & DRZ Works (Indirects):

There are no options for this area as SPEN propose to reflect the Indirects Scalar outlined by Ofgem in Section 6.84 of RIIO-ED2 Final Determination Overview Document for use in load-related uncertainty mechanisms within RIIO-ED2. This scalar, set at 10.8%, is an automatic mechanism for varying Closely Associated Indirect (CAI) costs associated with the Secondary Reinforcement volumes driver, LV Services volume driver, and overall Load-Related Expenditure (LRE) reopener. Given that the proposed interventions within this reopener will also affect CAIs, we believe that applying the 10.8% scalar to Initiatives 1 - 6 is also justified. This is considered the Do Minimum approach.

Operation of DRZ

The following options were considered with Option 2 (Do Minimum) chosen.

Table 15 – Initiative 7 (Operation of DRZ) Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing - Absorb workload with existing staff	Rejected	Skillsets are different for our Distributed Restart Zone in SPD; Existing Control Room Engineers have already demanding tasks
Option 1	Dedicated 2 Control Engineers at each of 3 DRZs, 24/7	Rejected	This will mean [redacted] **additional distribution control engineers** in the Control Room in SP Distribution, taking into account the shifts and other supporting functions (as set out in Option 1 above)
Option 2 (Do Minimum)	Dedicated 1 Control Engineer at each of 3 DRZs, with every shift 24/7	Recommended	Recommended. This option will provide the best balance between technology (i.e. using our OCC SCADA advance creations) and dedicated staff, [redacted] distribution control engineers. This requires [redacted] **additional FTE** as set out in Option 2 above.

ESR Assurance

The following options were considered with Option 2 (Do Minimum) chosen.

Table 15 - Initiative 7 (ESR Assurance) Options Summary

Option	Option Description	Decision	Comment
Baseline – Do Nothing	Do nothing - Absorb workload with existing staff.	Rejected	ESR assurance requirements not achieved.

Option 1	2 ESR Coordinator & 1 ESR Assurance Manager per licence area	Rejected	This would future proof the SPM area for future DRZ development.
Option 2 (Do Minimum)	2 ESR Coordinator & 1 ESR Assurance Manager spread across both Licences – the basis for these resources is outlined in EJP.	Adopted	ESR Assurance requirements are met with minimum number of staff. Takes advantage of the fact that SPEN own and operate both SPD and SPM. A common Management resource across both ensures consistency and allows reduced staff requirements.

Our Proposed Investment

We are seeking to implement the following investment.

Table 16 – Initiative 7 Proposed Investment

Investment	Description	Benefit
Delivery of Asset Resilience & DRZ Work (Indirects)	Dedicated Project Managers for delivery of work outlined in EJP 001 – 006. Request based on 10.8% scalar.	Supports delivery of our asset resilience and DRZ work on time and in budget.
DRZ Operation	Additional resource to effectively co-ordinate the creation and expansion of the network island and the real time balance of generation and demand.	Provides balance between technology and dedicated staff during system restoration event.
ESR Assurance	Creation of a dedicated team to fulfil ESR assurance requirements.	Provides robust assurance, regular testing, and evidence-based reporting that ensures the required level of ESR service is achieved and mandatory annual progress reports on meeting these new obligations.

Additional costs arising from this investment

Total Cost	£9.207m

5. Delivery & Costs

5.1. Deliverability

The initiatives presented within this submission will be delivered in addition to all existing ED2 work programmes.

For Initiatives 1 - 3, SPEN has demonstrated delivery of this type of work as part of current plans and will make use of the internal project management experience in these areas, and our relationships with service partners. The volume profiles have been carefully forecasted following engagement with the responsible teams, increasing delivery rates whilst taking a view of shared resources, product availability and forward planning into RIIO-ED3. Further details are presented in the associated EJPs within this submission (001-003).

Initiatives 4 - 7 will be delivered by a dedicated project team within SPEN. Long-lead item orders have previously been placed to ensure the delivery plan continues as forecasted. Further details are presented in the relevant EJPs within this submission (004-006).

Details on the additional resourcing plan required to deliver DRZ projects, including the operation of completed DRZs, and resources required as part of a new ESR Assurance team, are presented in the Resources EJP within this submission (007).

5.2. Delivery Plan

The delivery plan and ESRt for SPD is as follows:

Table 17 – SPD Delivery Plan & ESRt

Initiative	25/26	26/27	27/28	Total
Initiative 1 - 132kV network Resilience	£0m	£0m	£0m	£0m
Initiative 2 - Primary Substations Network Resilience	£0m	£0.815m	£1.246mm	£2.061m
Initiative 3 - Substation Telecommunications Resilience	£0m	£1.997m	£1.369m	£3.366m
Initiative 4 - DRZ – Central Scotland	£0.983m	£6.014m	£7.979m	£14.975m
Initiative 5 - DRZ – Dumfries & Galloway	£0.327m	£1.752m	£1.861m	£3.940m
Initiative 6 - DRZ - Fife	£5.158m	£6.760m	£7.006m	£18.925m
Initiative 7 - Staff resources	£1.637m	£2.811m	£3.041m	£7.490m
SPD ESRt	**£8.105m**	**£20.149m**	**£22.502m**	**£50.757m**
				All costs are in 2020/21 prices

The delivery plan and ESRt for SPM is as follows:

Table 18 – SPM Delivery Plan & ESRt

Initiative	25/26	26/27	27/28	Total
Initiative 1 - 132kV network Resilience	£0m	£1.673m	£2.231m	£3.904m
Initiative 2 - Primary Substations Network Resilience	£0m	£1.549m	£2.388m	£3.937m
Initiative 3 - Substation Telecommunications Resilience	£0m	£2.694m	£2.234m	£4.928m
Initiative 4 - DRZ – Central Scotland	£0m	£0m	£0m	£0m
Initiative 5 - DRZ – Dumfries & Galloway	£0m	£0m	£0m	£0m
Initiative 6 - DRZ - Fife	£0m	£0m	£0m	£0m
Initiative 7 - Staff resources	£0.113m	£0.752m	£0.853m	£1.717m
SPM ESRt	**£0.113m**	**£6.669m**	**£7.705mm**	**£14.486m**
				All costs are in 2020/21 prices

5.3. Cost Assumptions

All funding requests within this re-opener application have been reflected in 2020-21 costs.

Additionally, SPEN proposes to reflect the Indirects Scalar outlined by Ofgem in Section 6.84 of the RIIO-ED2 Final Determination Overview Document for use in load-related uncertainty mechanisms within RIIO-ED2. This scalar, set at 10.8%, is an automatic mechanism for varying Closely Associated Indirect (CAI) costs associated with the Secondary Reinforcement volumes driver, LV Services volume driver, and overall Load-Related Expenditure (LRE) reopener. Given that the proposed interventions within this reopener will also affect CAIs, we believe that applying the 10.8% scalar to Initiatives 1 - 6 is also justified.

5.4. Efficiency of Costs

We have undertaken an analysis of the efficiency of costs as part of developing our proposed ESR investment programme in alignment with Ofgem's RIIO-2 Re-opener Guidance and the application requirements of the ESR re-opener, assessing several options and ensuring that we deliver the proposed solution utilising the most cost-effective approach for our consumers.

For the asset resilience costs (details displayed in EJP 001-003), we have engaged with current delivery teams and made use of existing agreements with service partners to obtain quotations for previous works, allowing for detailed cost forecasting. All costs were then converted to 2020/21 prices.

DRZ costs (details displayed in EJP 004-006) have been derived in the main from the SPEN unit cost manual, which was used to develop CV7 GSP work programmes in the RIIO-ED2 submission. These costs have been uplifted to reflect the increase in labour and materials between the initial RIIO-ED2 settlement. All costs were then converted to 2020/21 prices.

Where a programme does not have an agreed Unit Cost Manual Line, SPEN have undertaken cost benchmarking using a set of different approaches:

- Directly engaging the market and existing suppliers for technology pricing.
- Considering current costs for existing tools and systems.

We have previously provided evidence of engaging the market and leveraging the wider organisation to ensure competitively accurate quotes from the current marketplace. By using this same approach, we have been able to provide figures of what the baseline costs for each of the workstreams would be, anticipating how much the implementation would cost, considering additional resources, tooling, and the requirement to align with the basic profile of the CAF.

We have divided the costs across our three licences, but the capabilities described in this workstream will need to be replicated across SPT, SPD and SPM, hence we are only requesting a portion of the total costs we require to deliver the capability across SPD and SPM.

Staff resources costs (details displayed in EJP 007), the salary mid-point (including all additional costs such as pension and national insurance) was obtained from HR. 2. All costs were then converted to 2020/21 prices.

5.5. Reporting

In line with existing SPEN ED2 work programmes, each of the initiatives in this submission has been assigned to individual owners with responsibility to implement the required changes and track progress throughout. Cost and volumes have been agreed with owners and will be monitored via internal governance processes. Additionally, the costs and volumes will be reported to Ofgem via the relevant Regulatory Reporting Pack (RRP).

SPEN intends to begin delivery of all initiatives as early as funded. This investment is not predicated on a particular scenario and will go ahead as targeted investment following approval of the reopener submission.

5.6. Proposed Funding Mechanism

SPEN proposes the use of a Use It Or Lose It (UIOLI) mechanism for all final allowances approved by Ofgem under this reopener application. All allowances and outputs should be separated from equivalent activities we are delivering through RIIO-ED2 baseline programmes.

We are submitting this request for allowances based on a UIOLI funding mechanism, we intend to deliver the investment as described within this reopener submission. Across the number of initiatives included within our submission there are various outputs and volumes of activity, these will form the basis of our planned delivery to ensure we achieve the planned level of ESR resilience. This may mean that some of the planned expenditure varies across activities as we deliver the investment and the exact scope of works is refined, but all reopener allowances will be hypothecated to the initiatives detailed within this submission.

6. Conclusion

The initiatives outlined in this re-opener application have been developed following review of the ESRS. They recognise the critical need to protect customers and national infrastructure by proactively improving our network's ability to meet the target restoration times of restoring 60% of regional electricity demand within 24 hours and 100% of national demand within five days.

All investment proposed is above existing RIIO-ED2 ex-ante allowances, with the drivers and outputs separate and ring-fenced. Investment is sufficiently justified through qualitative reasoning and cost benefit analysis tools, with interventions identified through targeted risk-based approaches considering the impact of extended power cuts on our customers.

These proposals result in total investment of £65.244m across both licences (£50.757m in SPD and £14.486m in SPM).

Table 19 – Delivery Plan & ESRt

Initiative	SPD	SPM	SPEN
Initiative 1 - 132kV network Resilience	£0m	£ 3.904m	**£ 3.904m**
Initiative 2 - Primary Substations Network Resilience	£ 2.061m	£ 3.937m	**£ 5.998m**
Initiative 3 - Substation Telecommunications Resilience	£ 3.366m	£ 4.928m	**£ 8.294m**
Initiative 4 - DRZ – Central Scotland	£ 14.975m	£ 0m	**£ 14.975m**
Initiative 5 - DRZ – Dumfries & Galloway	£ 3.940m	£ 0m	**£ 3.940m**
Initiative 6 - DRZ - Fife	£ 18.925m	£ 0m	**£ 18.925m**
Initiative 7 - Staff resources	£7.490m	£1.717m	**£9.207m**
Total Costs (ESRt)	**£50.757m**	**£14.486m**	**£65.244m**
			All costs are in 2020/21 prices

This is through the roll out of 7 initiatives to meet the requirements of ESRS including:

- improving network asset resilience, allowing for increased flexibility in response to an event, leading to faster restoration times and reduced long-term impact
- establishing distributed restart zones, establishing local power islands, providing an option to power up from Distribution to Transmission systems; and
- supporting staff resourcing and reduce the reliance on manual interventions during an event response.

All these proposals were developed reflecting detailed stakeholder and customer engagement and reflect the priorities identified by those stakeholders.

SPEN recognise that there is a second ESR Re-opener window in June 2027 for any additional costs or initiatives not suitably developed for inclusion in this window. Currently we do not anticipate a need to submit during this next window.

7. Summary of Further Evidence

The following documents have been appended to this re-opener submission to provide additional information and engineering justification for initiatives:

- Main Document Appendix: All appendices referenced in this document have been included in a single Appendix Document, submitted as part of the re-opener application.
- Engineering Justification Papers: EJPs have been included for all the programme initiatives, these include:
    - Initiative 1 – ED2-ESRR-SPEN-ESR-001-EJP 132kV Substation Network Resilience
    - Initiative 2 – ED2-ESRR-SPEN-ESR-002-EJP Primary Substation Network Resilience
    - Initiative 3 – ED2-ESRR-SPEN-ESR-003-EJP Substation Telecommunications Resilience
    - Initiative 4 – ED2-ESRR-SPEN-ESR-004-EJP REPOWER Central Zone
    - Initiative 5 – ED2-ESRR-SPEN-ESR-005-EJP REPOWER Dumfries & Galloway Zone
    - Initiative 6 – ED2-ESRR-SPEN-ESR-006-EJP REPOWER Fife Zone
    - Initiative 7 – ED2-ESRR-SPEN-ESR-007-EJP Additional Resources
- NESO Letters of Support: The National Energy System Operator (NESO) has written to SPEN and provided 2 separate letters of support for our proposed network resilience upgrades and DRZ rollout.
- Cost Benefit Analysis: For initiatives 1, 2, 3, 4, 5 and 6.
- S&C Electric's Independent Expert External Assurance Report: We have commissioned a third-party review of this submission against Ofgem's re-opener application guidance. Their assessment of this submission and its appended/supporting documents has also been appended.
- Independent Net Zero Advisory (INZAC) Letter of Support: The main body of this submission was reviewed by SPEN's Independent Net Zero Advisory Committee (INZAC. They were fully supportive of the submission proposals and provided a Letter of Support.