SPNLT20286 Westfield 132kV Switchgear Replacement

Issue 1.0

11/12/24

SP Energy Networks
RIIO-T3 Business Plan

Westfield 132kV Switchgear Replacement			
Name of Scheme	Westfield 132kV Switchgear Replacement		
Investment Driver	Asset Health		
BPDT/Scheme Reference Number	SPNLT20286		
Outputs	• CB (Air Insulated Busbar) (OD) 132kV		
Cost	£35.33m (23/24)		
Delivery Year	2028		
Applicable Reporting Tables	5.1_Project_Meta_Data, 7.1_Scheme_C&V_NonLoad_Actuals, 10.2_Asset_ID, 10.3_Site_ID, 11.10_Contractor_Indirect		
Historic Funding interactions	SPNLT2035 / SPNLT20255		
Interactive Projects	Tealing to Kincardine Uprating Project (TKUP) / Eastern Green Link 4 (EGL4) HVDC scheme		
Spend Apportionment	ET2	ET3	ET4
	£8.19m	£27.14m	£0.00m

Table of Contents

1. Introduction

Westfield 132kV Substation is located near the village of Ballingry and is a key site for the 132kV network in Fife.

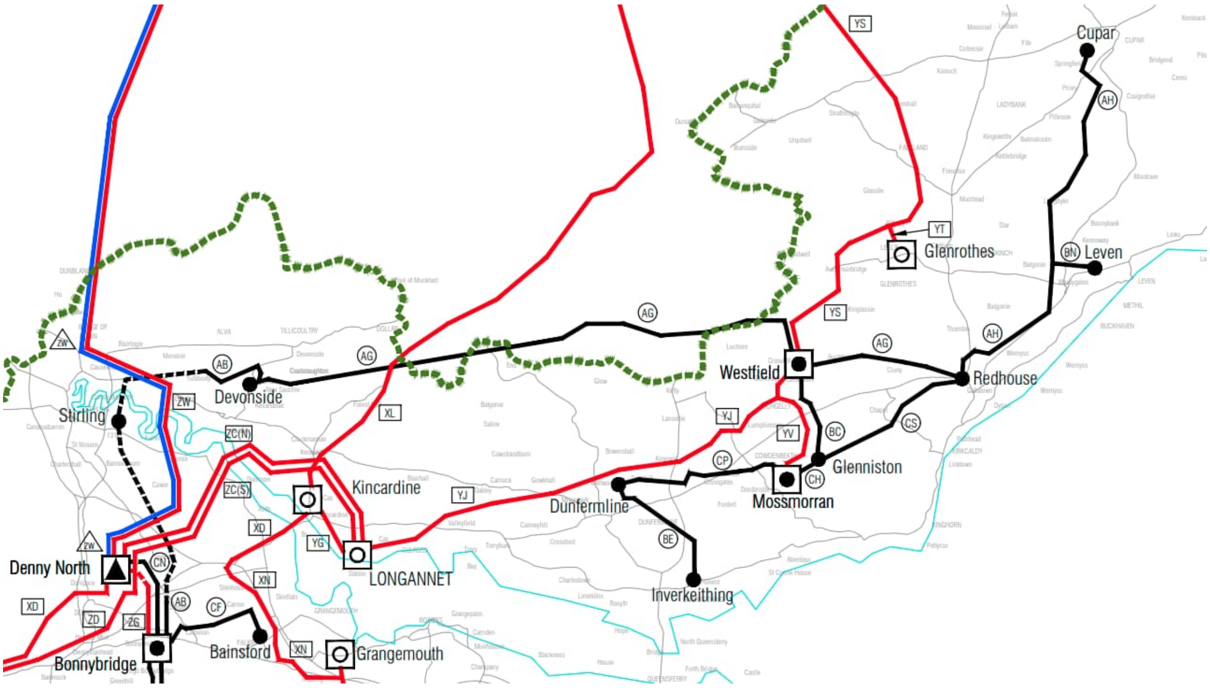

Figure 1 - Geographical Network Diagram of network connections to Westfield.

This paper supports a proposal to replace the existing Westfield 132kV Substation with a GIS switchboard. This project was submitted in the RIIO-T2 submission was driven by the need to replace the Bulk Oil circuit breaker population due to their condition and increased difficulty in their maintenance. In the intervening period a number of failures and increased issues with the circuit breaker bushings has accelerated the replacement of the breakers to maintain the existing network security. The supporting apparatus and structures are also of a deteriorated state and in need of replacement. Future network upgrades and contracted and future customer connections [redacted] indicate this replacement as enabling works to facilitate the connections. Furthermore, the ASTI projects TKUP and the EGL4 HVDC requirements have also been taken into consideration in this paper. The substation is proposed to be replaced with a 14 bay GIS located within the existing Westfield 275kV compound with facility for 4 bays for future expansion.

In line with the above, the proposed 132kV outputs to be delivered in this project for the selected option are set out in Table 1.

Asset	Voltage	Intervention	Addition	Disposal	Delivery Year
Assets CB (Air Insulated Busbar)132kVEach	132kV	Replacement	-	11	2028
Asset CB (Gas Insulated Busbar) (ID)132kVEach	132kV	Replacement	14	-	2028

Table 1 – Proposed Outputs associated with the selected option.

2. Background Information

System Design Table	Circuit/Project	Baseline: Do nothing/minimum	Option 1: Replace substation with GIS	Option 2: Replace with AIS
Thermal and Fault Design	Existing Voltage (if applicable)	132kV	132kV	132kV
	New Voltage	132kV	132kV	132kV
	Existing Continuous Rating (if applicable)	2000A	2000A	2000A
	New Continuous Rating	2500A	2500A	2500A
	Existing Fault Rating (if applicable)	25kA	25kA	25kA
	New Fault Rating	31.5kA	31.5kA	31.5kA
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A	N/A	N/A
	New MVAR Rating (if applicable)	N/A	N/A	N/A
	Existing GVA.s Rating (if applicable)	N/A	N/A	N/A
	New GVA.s Rating	N/A	N/A	N/A
System Requirements	Present Demand (if applicable)	N/A	N/A	N/A
	2050 Future Demand	N/A	N/A	N/A
	Present Generation (if applicable)	N/A	N/A	N/A
	Future Generation Count (direct connections)	[redacted]		
	Future Generation Capacity (licensee forecast)	[redacted]		
Initial Design Considerations	Limiting Factor	N/A	N/A	N/A
	AIS/ GIS	GIS	GIS	AIS
	Busbar Design	Double Busbar	Double Busbar	Double Busbar
	Cable/ OHL/ Mixed	Mixed	Mixed	Mixed
	Strategic Investment	TKUP, EGL4	TKUP, EGL4	TKUP, EGL4

The delivery of the project is staged and aligned with other planned outages on the network and maintaining network supply. The works will carry out an offline build of the GIS building with a subsequent staged approach to the transfer of circuits from the existing AIS substation to the new GIS substation. The outages require to consider the other works on the System in the immediate vicinity, notably the Tealing to Kincardine uprating project (TKUP) and the Eastern Green Link 4 (EGL4) HVDC scheme. The interactions of these projects are being developed and outcomes and alignment of timelines has and will consider the work elements in this scheme.

2.1. Data Collection and System Overview

As part of the SP Energy Networks (SPEN) Substation inspection regime, a detailed site review and technical assessment of the condition of the lead and non-lead assets has been carried out by SP Transmission.

2.1.1. Asset Condition

2.1.1.1. Switchgear

Westfield 132kV Substation had been identified in the RIIO-T2 business plan (scheme SPNLT2035 was approved at Final Determination) as requiring the replacement of main plant equipment based on detailed condition assessments. Specifically, the original [redacted] circuit breakers remaining were in very poor condition with an P Band of 9-10. The detailed condition assessments considered this main plant equipment to be at the end of their useful life and need to be replaced.

Subsequently, the Bulk Oil switchgear at Westfield 132kV substation had an operational restriction (SOP 411) applied (which remains in force) due to failure of the BL barrier bushings. SOP 411 was introduced for all assets with [redacted] bushings following failures in [redacted] and updated after a failure in the SP Transmission area of [redacted] bulk oil circuit breakers. The investigations of [redacted] and SP Transmission independently identified particulate levels higher than the acceptable limits. The SOP requires the bushings to be sampled from the top cap and main body of the bushing every three years and result compared against key end of life indicators and the asset is replaced if the particulate count and the presence of a key end of life indicator is present.

SOP 411 also restricts personnel from encroaching on Risk management Zones during specified conditions. Due to the bushings being integral to the design of the circuit breaker, SOP 411 remains until the circuit breakers are replaced. The remaining circuit breakers are a mix of SF_6 and SF_6-free models. Circuit breaker 120 / 530 / 710 will be refurbished under scheme SPNLT20255 aiming to be retained as strategic spares. The remaining SF_6 circuit breakers would be removed from service. The SF_6-free circuit breakers shall be retained either as a strategic spares or be utilised on another project. Details below in table 2:

Circuit Breaker	Circuit	Model (As of Nov 2024)	Insulating Medium
120	Bus Section	[redacted]	SF_6
200	Devonside	[redacted]	SF_6
255	Redhouse	[redacted]	'Blue Air'
300	Bonnybridge/Stirling	[redacted]	SF_6
355	Leven/Cupar	[redacted]	Mineral Oil
480	SGT2	[redacted]	G^3
530	Bus Coupler	[redacted]	SF_6
580	SGT1	[redacted]	'Blue Air'
610	T2	[redacted]	SF_6
650	Glenniston	[redacted]	SF_6
710	T1	[redacted]	SF_6

Table 2. Circuit Breaker Models and Insulating Mediums

Circuit breaker 355 is the last remaining Bulk Oil Circuit Breaker at Westfield. This is planned to be replaced in 2025 as a result of the SOP 411 issue.

The disconnectors are of a condition and age where spare parts are difficult to obtain or require the removal of parts from other assets and replacement is therefore required and is included in all of the proposed options.

Instrument transformers that have been replaced as part of the RIIO-T2 PCB replacement programme will be recovered and reused.

2.1.1.2. Fault Levels 132kV

The current configuration of the 132kV substation forces the running of the site with an open bus coupler for fault level issues. This requirement would be removed with this project.

2.1.1.3. Protection and Control Schemes

The protection and control equipment is classified with a range of health indices (1 to 5) reflecting the incremental development of the site and the shorter asset lives of electronic equipment. Lower health index devices will be retained for use as spares.

2.1.2. Re-cost and review from RIIO-T2

An exercise was carried out to refresh the costs and scope of the three options considered in the RIIO-T2 submission for this scheme. This was due to the emergence of SOP 411 and also the change in costs since the original submission for SF_6-free GIS. The three options originally considered in the RIIO-T2 scheme are:

1. In situ online 13 bay AIS replacement of existing AIS switchgear with new AIS switchgear. This option considered reuse of existing concrete gantries, foundations and existing disconnector structure / foundation.
2. Offline 14 bay GIS replacement for the existing AIS switchgear with switchgear located within the 275kV compound.
3. Offline 14 bay GIS replacement for the existing AIS switchgear with switchgear located on the east side of existing 132kV compound.

The refresh indicated that the increase of costs in GIS and SF_6-free versions which necessitated a review of the intervention options.

A review of the available data is described in the following sections.

2.1.2.1. Civils

An updated review of the condition of the civil structures indicated further deterioration since the RIIO-T2 business planning process. From a civil perspective, the recommendation is that the structures, including integrated disconnector and high level structures and busbar support structures are at end of life. Repair companies may be able to offer 10-year maximum life but with 2-3 maintenance interventions required within that timeframe at which point a rebuild will be required. Figure 2 shows examples of the concrete condition at Westfield 132kV Substation.

[redacted]

Figure 2. Examples of condition of Westfield concrete structures

2.1.2.2. Network Planning

As the GIS design approved at RIIO-T2 Final Determination had been proven to be the most economical option, subsequent network development and connection offers were based on this solution. The implications of a longer construction and outage programme for an AIS solution would present an unacceptable risk of delay of the TKUP works, have a material impact on wider network outage plans and result in a delay in the completion of works necessary for contracted connections.

2.1.2.3. EGL4 HVDC Scheme

The EGL4 HVDC Project is developing a converter station to the east of Westfield. [redacted] for EGL4. Figure 3 shows an indicative positioning of the EGL4 cable corridors , the proposed converter station and site establishment. It may be required to divert the Redhouse and Leven/Cupar overhead line routes to facilitate this build. The works in the proposed option are not affected by EGL4. However, coordination with EGL4 will allow the circuit outages and cable and primary plant to be more effectively used.

[redacted]

Figure 3. Proposed EGL4 layout.

2.1.2.4. TKUP

The Tealing to Kincardine Project is in place to create a new 400kV corridor over the B4 boundary. In relation to this project, TKUP will form a new 400kV GIS Substation to replace the existing 275kV substation. The sequencing of works requires that the 132kV switchgear replacement has taken place before the 400kV GIS works. Facilitation of the TKUP scheme will require the removal of a section of AG Route on the Stirling/Bonnybridge and Devonside circuits. This is to allow for the formation of the substation platform and substation build. The 400kV substation is also required for the connection of larger scale Battery Storage schemes and Mechanically Switched Capacitors for voltage and reactive power control.

[redacted]

Figure 4. TKUP Westfield 400kV Proposed Substation

2.1.2.5. Flood Risk

The area of land south of Westfield is also identified as at risk of surface water flooding according to the SEPA Flood Map data. Figure 5 shows the surface water flood risk of the area immediately south of the substation.

[redacted]

Figure 5. SEPA Flood map showing Surface Flood Risk around Westfield

2.1.3. Further review of AIS and GIS costing

A review and re-cost exercise was then undertaken to consider the foregoing factors. The in-situ refurbishment option was discounted due to the view that regular maintenance of the civil assets (two to three interventions in a ten year period as described in 2.1.2.1) that would be required and eventual replacement with an AIS or GIS would be needed.

2.1.3.1. Option 1: AIS rebuild with 132kV extension

The AIS re-build comparison proposed a like for like replacement of the existing double busbar wraparound configuration with consideration of ground preparation cost for four extra bays for future extension. The costing of the main plant has included the following considerations:

1. Maintaining existing circuit allocations to busbar sections, retaining the current level of circuit security.
2. T1, T2, and the Glenniston, Redhouse and Leven/Cupar circuits' line entries are considered as immovable due to the lack of alternative siting options.
3. The re-positioning of the Devonside and Stirling/Bonnybridge line entries necessary to facilitate the TKUP project is considered for cable costing (for AIS and GIS options). The proposed tower repositioning is currently included in the scope of the TKUP project and is common to both the 132kV AIS and GIS options.
4. Consideration of population of spare bay and cable for contingency on [redacted].

Figure 6 indicates the indicative layout considering the requirements above and accounting for maintenance access requirements.

[redacted]

Figure 6. Indicative AIS replacement of Westfield 132kV

The maintenance access requirements increase the lateral space needed compared to the original layout in figure 7.

[redacted]

Figure 7. Existing layout of Westfield 132

Given the fixed points, there is a requirement to have cable connections for the T2 and Redhouse circuits where previously this was fed via direct busbar connection. The Devonside and Stirling/Bonnybridge circuits are now cable entry into Westfield 132kV. An extra bay is included for provision of a cable connection to AG034 (Redhouse and Leven/Cupar circuits). Any extension to the AIS will require to be to the left-hand side of the AIS. This is due to the 33kV substation and the 33kV distribution cables blocking any further extension on the right-hand side of the substation. Further extension will require additional ground preparation and works to readjust the busbar arrangement.

2.1.3.2. Option 2 - GIS offline build (132kV substation constructed in the 275kV compound)

The GIS option was the preferred option of scheme SPNLT2035 approved at RIIO-T2 Final Determination . Given the TKUP requirements, it is necessary to also include the cable costs for the Devonside and Stirling/Bonnybridge (AG route) circuits, in common with the AIS option. This cable cost would be reduced due to the shorter route required compared to a cable run to the existing terminal tower for those circuits. The AG route dismantling and re-termination is included in the scope of the TKUP project. Further work includes rerouting of the 33kV cables for T1 and T2 due to the cabling requirements from the proposed entry points to the new GIS and also the inclusion of demolition cost of one of the 275kV bays for the GIS offline build). The Indicative layout post completion is shown in Figure 8 below.

[redacted]

Figure 8. 132kV layout post replacement works.

2.2. CBRM Summary

The overall Asset Health information derived from NARM for Westfield 132kV is as shown in table 4.

Asset	Present Health	Future Health *(8 years)*	Future Health *(20 years)*	Risk *(Present)*	Main Health Drivers	Comments
CB (Air Insulated Busbar) (OD) 132kV - 120	P1	P2	P4	R2	-	132kV SF_6 Dead Tank Commissioned 2022. Manufactured 2010
CB (Air Insulated Busbar) (OD) 132kV - 200	P3	P4	P7	R2	-	SF_6 Live Tank Commissioned 1995
CB (Air Insulated Busbar) (OD) 132kV - 255	P1	P1	P2	R2	-	132kV SF_6-free VCB Commissioned 2024
CB (Air Insulated Busbar) (OD) 132kV - 300	P3	P4	P7	R2	-	SF_6 Live Tank Commissioned 1995

CB (Air Insulated Busbar) (OD) 132kV - 355	P8	P10	P10	R3	SOP 411	Oil Circuit Breaker Commissioned 1969
CB (Air Insulated Busbar) (OD) 132kV – 480	P1	P1	P2	R2	-	OCB Decommissioned. Replacement 2024 with SF_6 free Circuit Breaker.
CB (Air Insulated Busbar) (OD) 132kV - 530	P1	P2	P4	R2	-	132kV SF_6 Dead Tank Commissioned 2022. Manufactured 2010
CB (Air Insulated Busbar) (OD) 132kV - 580	P1	P1	P2	R2	-	132kV SF_c free VCB Commissioned 2024
CB (Air Insulated Busbar) (OD) 132kV - 610	P2	P3	P6	R2	-	SF_6 Dead Tank Commissioned 2021. Manufactured 2000
CB (Air Insulated Busbar) (OD) 132kV - 650	P2	P4	P7	R2	-	SF_6 Live Tank Commissioned 1997
CB (Air Insulated Busbar) (OD) 132kV - 710	P1	P2	P4	R2	-	132kV Dead Tank Commissioned 2022. Manufactured 2011

Table 4 – Asset Health for 132kV CBs at Westfield Substation

3. Optioneering

This section provides a description of each intervention option and details the key considerations. A summary of each option is described at the end of this section.

The options considered are in line with SP Transmission's sustainability and innovation policy and commitments. This includes the proposal to reuse existing concrete assets where possible, as well as installation of SF_6-free technology where feasible, and consideration of alternative construction methods aimed at reducing the company's carbon footprint.

The background information for these options is described in section 2.

3.1. Baseline, deferral until RIIO T4

This option considers the refurbishment of the civil structures in the substation and the ongoing maintenance and repair as part of business as usual. This option involves the minimum level of intervention through maintenance and repairs that is required to remain compliant with all relevant safety and legal requirements.

The intervention timeline considered within this option is summarised below:

- RIIO T3 Period [2027-2031]: Ongoing maintenance and repair of existing equipment and civil structures repair and refurbishment.
- RIIO T4 Period [2032-2041]: Replacement of 132kV Substation with 132kV GIS substation solution as described in Option 2.

3.2. Option 1: AIS replacement of existing 132kV Substation and provision for four extra AIS bays

This option considered the replacement of the existing AIS with a new double busbar wraparound substation. This option would require the extension of the existing compound to allow for a rebuild of the substation to take place. The AIS replacement would require a half substation outage to allow for the new half of the substation to be built and then connected to the existing half of the substation in between outage seasons. Furthermore, the extension of the compound would require to be large enough to accommodate four extra AIS bays for extension. However, this will limit future operational flexibility as the option considers minimising the additional works to connect the existing circuit entries into the new bays. The simplified overview of the works, including all relevant protection and control works is described below:

- Ground preparation adjacent to the existing site to match existing compound heights.
- Construct compound extension and apparatus offline.
- Outage to disconnect circuits from the left-hand side of the existing Bus Section and amend running arrangements of circuits remaining in service.
- Demolish disconnected circuits.
- Construct replacement circuits offline.
- Install new cross site cabling to tie in new equipment with existing overhead line entries. Tie into existing site for running arrangements outwith replacement outages.
- Commission new section of substation.
- Outage to disconnect remaining legacy AIS equipment and demolish.
- Construct the replacement AIS equipment and tie into the existing newly constructed circuits.
- Commission and energise the circuits to compete the substation replacement.
- Carry out remote-end protection modifications and replacements.

3.3. Option 2: 132kV GIS Replacement in the existing 275kV Substation

This option considers the replacement of the 132kV AIS substation with 132kV SF_6 free GIS. The GIS is constructed within the confines of the 275kV substation in the space that is freed from a spare bay which is to be demolished. The 33kV cables for T1 and T2 require to be diverted to facilitate the 132kV cabling from the existing OHL entry points. The Stirling/Bonnybridge and Devonside circuits cabling is costed to the proposed diversion points. The outages to transfer the circuits can be aligned more with network conditions to secure supplies in the Fife area. The overview of works is as follows:

- Demolition of spare 275kV Bay.
- Preparation and build of the 132kV GIS building including protection and auxiliary systems.
- Carry out diversion of 33kV cables to existing 33kV buildings.
- Install 132kV Cabling and to connect new 132kV GIS.
- Install ducting and cabling to new circuit positions.
- Transfer of circuits to new 132kV GIS.
- Demolish AIS equipment. Retain SF_6 free circuit breakers as strategic spares.
- Carry out remote-end protection modifications and replacements.

Options	Map	Layout of Substation/ Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Risks	Narrative Preferred Option	Narrative Rejection
Preferred – Option 2	See figure 1	Refer to Appendix A	No route impacts	Asbestos and concrete base survey works	No consenting risks	Replacement of remaining OCBs with standing SOP and equipment with no manufacturer support and poor condition of civil assets. Works within the existing substation footprint and outwith areas prone to flooding. Outages for transfer of circuits minimises risk to Fife 132kV network.	N/A
Rejected – Option 1	See figure 1	Refer to Appendix A	No route impacts	Asbestos and concrete base survey works. Flood mitigation	No consenting risks	N/A	Additional ground preparation required to create a like for like replacement. Sections of Fife network at greater unrecoverable risk and also risk deliverability of the associated major projects TKUP and EGL4. Extension will encroach in a known flood risk area and require mitigation. Extension for additional bays will require further ground preparation costs and mitigation.
Rejected - Baseline	See figure 1	Refer to Appendix A	No route impacts	Asbestos and concrete base survey works	No consenting risks	N/A	Existing concrete refurbishment on condition of existing is expected to have a life extension of 10 years with 2-3 maintenance interventions required within that timeframe. Replacement of the substation (AIS or GIS) will be required after that. Availability of spares on existing legacy 132kV apparatus for repairs limited.

3.4. Selected Option

Option 2 achieves the main objective of replacing the existing AIS substation with poor condition circuit breakers, disconnector and civil assets with SF_6 free Gas Insulated Switchgear. Including cabling works and protection replacement at the remote end sites. The replacement will reduce network risk and ensure operational safety on asset types are aged and at end of life. A comparison of the option costs and NPVs is set out in table 5.

Option No.	Description Of Option	Preferred Option	Total Cost (£m)	Total NPV (£m)	Delta *(Option to baseline)*
Baseline	Baseline	N	42.05	-18.37	-
1	AIS replacement of existing 132kV Substation and provision for four extra AIS bays in RIIO-T3	N	38.76	-19.68	-1.3
2	132kV GIS Replacement in the existing 275kV Substation in RIIO-T3	Y	35.33	-16.16	2.2

Table 5 – A High-Level Cost and NPV Comparison of the Options

Note: The key driver behind the intervention is the condition of the non-lead assets. Since the risk reduction associated with these assets it is not monetised, as they are not captured under the NARM methodology, the quantifiable risk benefit is not fully reflective of the risk reduction associated to this intervention, hence negative NPV values. However, the selected option presents the best value for consumers across all options considered.

4. Cost

The preferred option for this scheme is the replacement of the existing AIS substation with an SF_6 free Gas Insulated Switchgear solution. The work includes the offline build of a new 132kV substation, the transfer of circuits from the old to new substation, protection and auxiliary supplies replacement, cabling works and the demolition of the existing AIS equipment.

4.1. Estimated Total Project Cost

A Business Plan provision and estimated cost of the project is indicated in the following table. These costs include associated Contractor Indirect. To be referred to tables “7.1_Scheme_C&V_NonLoad_Actuals” and “11.10_Contractor_Indirect”.

Item	Description	Estimated CAPEX (£m 23/24)
1	Primary Plant Installation	[redacted]
2	GIS building	
3	132kV and 33kV Cabling	
4	Asset and Civil Demolition	
5	Protection and Control	
6	Batteries and Auxiliary Supplies	
7	Other Direct Costs	
8	Risk	
	TOTAL	35.33

Table 6 – Breakdown of project costs

Expenditure incidence is summarised in Table 7.

Estimated CAPEX value per year, £m, 23/24 price base									
Energisation Year	Yr. 2025: CAPEX	Yr. 2026: CAPEX	Yr. 2027: CAPEX	Yr. 2028: CAPEX	Yr. 2029: CAPEX	Yr. 2030: CAPEX	RIIO-T2 Total: CAPEX	RIIO-T3 Total: CAPEX	Total: CAPEX
2028	2.64	5.55	7.10	7.30	6.14	6.60	8.19	27.14	35.33

Table 7 – Expenditure Incidence

4.2. Regulatory Outputs

The indicative primary asset outputs are set out in Table 8.

Asset	Voltage	Intervention	Addition	Disposal	Delivery Year
Asset CB (Gas Insulated Busbar) (ID)132kVEach	132kV	Replacement	14	-	2028
Assets CB (Air Insulated Busbar)132kVEach	132kV	Replacement	-	11	2028

Table 8 – Regulatory Asset Outputs

5. Deliverability

We have applied SPT project management approach to ensure that this project work is delivered safely, and in line with the agreed time, cost and quality commitments. We have a proven track record of delivering essential transmission network upgrade projects and will draw upon this knowledge and experience to effectively manage these works. We have assigned a dedicated Project Manager to the works at every stage who is responsible for overall delivery of the scope and is the primary point of contact for all stakeholders. A key deliverability issue will be the availability of a SF6 free model of circuit breaker capable of fitting the space restrictions. Initial discussion with the supply chain indicates that only one manufacturer is able to supply a model that will be suitable.

5.1. Delivery Schedule (Level 1 Programme)

A standard approach has been applied to the planning phase of these works and that will continue for the reporting and the application of processes and controls throughout the lifecycle. Table 9 summarises the key milestones within the delivery schedule.

Item	Project Milestone	Estimated Completion Date*
1	Technical Approval	2024
2	ITT	2025
3	Tender Process	2025
4	Financial Authorisation	2025
5	Commence Site Works	2026
6	Complete Site Works	2028
7	Estimated Project Close Out	2029

*Calendar Years

Table 9 – Key Delivery Milestones

Regular meetings with the Project and Construction Management Teams will be undertaken to assess the ongoing effectiveness of the Project Management interfaces.

The Project Manager will facilitate internal Project Team Meetings, in which project progress and deliverables will be reviewed and any arising risks or issues will be discussed and addressed.

5.2. Risk and Mitigation

A risk register will be generated collaboratively during the initial design stages to identify any risks to the delivery plan. Mitigation strategies will also be developed to manage the risks identified and these will be implemented by the Project Manager. The risk register will remain a live document and will be updated regularly. Currently, the main scheme risks are as follows:

- Network access restrictions: Wider issues on the network restraining available capacity. Co-ordinate with outage planning teams to ensure outage plan takes into consideration the impact of delayed outages.
- Asbestos: the site is known for presence of asbestos. Detailed asbestos survey to be carried out at start of the project. Specialist contractor to be considered for any asbestos checks and removal works.
- Dismantling and construction in close proximity to energised circuits. Requirements of regular proximity outages has the potential of delaying programme: Demolition stages to be planned in advance of actual works.
- Project delays resulting in significant impact on network stability and increase constraint costs substantially.
- Alignment with adjacent major project: Project alignment needed to ensure that any future works which may impact the intended works are communicated once known and the intended construction works of TKUP and EGL4 are fully known.

5.3. Quality Management

SPT adopts a 'life cycle' approach to Quality Management in major project delivery. Our Management Systems are certified to ISO 9001, ISO 14001 and ISO 45001. Various areas applicable to these standards ensure a quality product is delivered. The significant areas detailed below:

5.3.1. Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product are detailed in the Project Risk Register.

The suppliers of main equipment may also receive a Factory Acceptance Test Inspection when the asset is being built.

5.3.2. Quality Requirements in Tenders

Each contract that SPT issues has a standard format. Specifically in relation to quality, this will include a Contractors' Quality Performance Requirement (CQPR). This CQPR represents a specification that details roles and responsibilities for all parties during the works, frequency and format of reporting. It will also specify the document management process to be adhered to during the delivery of the project. In addition to the CQPR, each project has a contract specific Quality Management Plan, detailing the inspection and testing regime for works as well as the records to be maintained.

5.3.3. Monitoring and Measuring During Project Delivery

SPT Projects undertake regular inspections on projects and contractors to monitor and measure compliance with SPT Environmental, Quality and Health and Safety requirements, as detailed in the contract specifications for the work. All inspections are visual, with the person undertaking the inspection ensuring that evidence of the inspection and any actions raised are documented.

The following inspections are completed:

- Quality Inspections (monthly)
- Environmental Inspections (monthly, with weekly review by third party Environmental Clerk of Works)
- Safety Assessments & Contractor Safety Inspection (daily, with full time Site Manager)
- Project Management Tours (monthly)

The scope of audits and Inspections is to determine compliance with:

- Procedures & Guides
- Planned arrangements for ISO 9001, 14001 & 18001
- Legal and other requirements.

5.3.4. Post Energisation

SPT Projects and SPT Operations carry out a Defect Liability Period Inspection within the Contract Defect Liability Period with the aim of identifying any defects and rectifying them with the contractors.

5.4. Environmental and Wayleave Considerations

5.4.1. Environmental Planning

The 33kV diversion cabling proposed to be around the 132kV site and the 132kV Cable circuits which leave the substation require environmental planning.

5.4.2. Wayleave Issues

Cable routes to proposed new terminal towers for Stirling/Bonnybridge and Devonside circuits require to be sought. 33kV Cabling route wayleaves to be considered.

5.4.3. Environmental Sustainability

ENV-01-007 encompasses all activities undertaken within and in support of SP Energy Networks three Licences. This includes operational and business support functions concerned with management of SP Transmission, SP Distribution and associated regulatory and commercial interfaces, products, services and their associated environmental, social and economic impacts. The policy makes the following commitments which shall be respected in any works associated with this scheme.

"SP Energy Networks will incorporate environmental, social and economic issues into our business decision-making processes, ensuring compliance with or improvement upon legislative, industry, regulatory and other compliance obligations. We will deliver this by being innovative and demonstrating leadership on the issues which are important to us and our stakeholders, and will:

- *Ensure the reliability and availability of our Transmission and Distribution network whilst creating value and delivering competitiveness by increasing efficiency and minimising losses.*
- *Reduce greenhouse gas emissions, working towards a zero-carbon emissions target by end of 2050, with interim targets of 15% by 2023 and 80% by 2030 from a baseline of 2013/2014*
- *Integrate climate change adaptation requirements into our asset management and operations processes to support business resilience and reduce the length and time of service interruptions;*
- *Consider whole life cycle impacts to reduce our use of resources to sustainable levels, improve the efficiency of our use of energy and water and aim for zero waste;*
- *Improve land, air and watercourse quality by preventing pollution and contamination and protecting and enhancing biodiversity in our network areas; and*
- *Improve our service to local communities, supporting their economic and social development, protecting vulnerable customers and respecting human rights.*

ENV-04-014 gives specific guidance on the management of incidents with environmental consequence, or potential for environmental consequences, over and above the general requirements for the management of incidents.

6. Conclusion

The three options proposed have been reviewed in terms of scope feasibility, cost, timescales and construction risks with Option 1 demonstrating the primary objective greatest reduction in network risk at the lowest cost with most favourable NPV.

This scheme requires regular coordination with the TKUP and the EGL4 strategic schemes. The design and implementation of the 132kV switchgear replacement may result in changes to the planned asset additions and disposals.

In line with the costs prepared, the proposed scope of works and CBA analysis, Option 2 – replacement of the existing AIS substation with a GIS SF_6-free substation in RIIO-T3 – is the selected option:

- Scheme Total Cost: £35.33
- Timing of investment: 2025-2030
- Price control period of outputs: 2028
- The scheme outputs and long-term risk benefit are set out in Table 10 and Table 11 respectively.

Asset	Voltage	Intervention	Addition	Disposal	Delivery Year
Asset CB (Gas Insulated Busbar) (ID) 132kVEach	132kV	Replacement	14	-	2028
Assets CB (Air Insulated Busbar) 132kVEach	132kV	Replacement	-	11	2028

Table 10 – Declared Outputs

- Long Term Risk Benefit:

Asset Description	Long Term Risk Benefit (LR£m)
Assets CB (Air Insulated Busbar)132kVEach	19.37

Table 11 – Long-term risk benefit

7. Appendices:

a. *Relevant drawings*
   i. *SP2004718: Switchgear Numbering for Westfield 132kV Substation GSN18(A)*
   ii. *CT4490-2-0000-DA-SPENEK-0119: Westfield Substation – Proposed Electrical Layout Showing 132kV GIS Option*
   iii. *BT3051-2-00JA-DA-SPTEE-0119: TKUP Kincardine North to Tealing 400kV Reinforcement – Proposed Electrical Layout*
   iv. *SP4190053: Eastern Green Link 4 – Westfield Converter Station Indicative Site Layout Indicative Earthworks*