Coylton - Maybole 132kV Reinforcement

Route Strategy EJP
Version: 1.0
11/12/2024

SP Energy Networks
RIIO-T3 Business Plan

SP Energy Networks

COYLTON-MAYBOLE 132kV REINFORCEMENT			
Name of Scheme	SPT-RI-3062 Coylton-Maybole 132kV REINFORCEMENT		
Investment Driver	Asset Health/Local Enabling (Entry)		
BPDT / Scheme Reference Number	SPT200865		
Outputs	• 54km 132kV OHL (Tower) 350MVA twin UPAS conductor (Addition) • 4.4km 132kV OHL (Tower) 295MVA twin HTLS 'Eagle' (Addition) • 54.55km 132kV OHL (Tower) 89MVA 'Lynx' conductor (Disposal) • 4.56km 132kV OHL (Pole) 89MVA ACSR 'Lynx' conductor (Disposal) • 145 132kV Towers (Addition) • 127 132kV Towers (Disposal) • 38 132kV Poles (Disposal) • 0.33km 132kV Circuit Cable – 1 core per phase (Addition) • 0.7km 132kV Circuit Cable – 2 core per phase (Addition)		
Cost	£91.75m (23/24)		
Delivery Year	2034		
Applicable Reporting Tables	BPDT (Section 5.1 Project Meta Data, Section 6.1 Scheme C&V Load Actuals and Section 11.10 Contractor Indirects)		
Historic Funding Interactions	None		
Interactive Projects	SPNLT20242 CG Route Minor Refurbishment		
Spend Apportionment	**ET2**	**ET3**	**ET4**
	£0.31m	£64.07m	£23.37m

1 Table of Contents

1 Table of Contents 2
1. Executive Summary 4
2. Introduction 5
3. Background Information 7
3.1. System Reinforcement Drivers 10
3.2. SP Distribution Support 10
3.2.1 New Generation Connections 12
3.3. Asset Conditions 14
3.3.1 X Route Conductor Assessment 14
3.3.2 X Route Visual Condition 14
3.3.3 N Route Conductor Assessment 14
3.3.4 N Route Visual Condition 14
3.3.5 CD Route Conductor Condition 14
3.3.6 CD Route Visual Condition 14
3.3.7 CG Route Visual Condition 15
4. Optioneering 16
4.1. Option 1: Baseline - Non-Load Intervention Works Only 16
4.2. Option 2: Reconductor X and CD Routes with HTLS conductor and rebuild N and CG Routes with trident wood pole structures and HTLS conductor 17
4.3. Option 3: Full Rebuild of Coylton – Maybole & Maybole – Kilmarnock South Circuits 21
4.4. Option 4: Reconductor X Route using HTLS 'EAGLE' Conductor and Full Rebuild of N, CD & CG Routes using L7 Towers and Twin 'UPAS' Conductors 24
4.5. Selected Option: Option 4: Reconductor of X Route using HTLS 'EAGLE' Conductor and Full Rebuild of N, CD & CG Routes using L7 Towers and Twin 'UPAS' Conductors 26
4.6. Whole Systems Outcomes 28
5. Project Costs 28
5.1. Estimated Project Costs 29
5.2. Regulatory Outputs 30
5.3. Environmental and Consent Works 31
6. Deliverability 31
6.1. Delivery Schedule (Level 1 Programme) 31
6.2. Risk and Mitigation 33

6.3. Quality Management 33
6.3.1. Quality Requirements During Project Development 34
6.3.2. Quality Requirements in Tenders 34
6.3.3. Monitoring and Measuring During Project Delivery 34
6.3.4. Post Energisation 34
6.4. Environmental and Wayleave Considerations 34
6.4.1. Environmental Planning 34
6.4.2. Wayleave Issues 35
6.4.3. Environmental Sustainability 35
7. Eligibility for Competition 36
8. Conclusion 37

1. Executive Summary

This engineering justification paper (EJP) sets out the needs case for:

- Replacement of the existing 132kV ACSR 'lynx' conductor on X Route with a double circuit HTLS 'Eagle' conductor;
- Replacement of the existing N Route and conductor system between Kilmarnock South Substation and the tee point at X Route with a 18km 132kV single circuit overhead tower line using L7 towers and twin UPAS strung on one side of the tower;
- Replacement of the existing CD & CG Route towers and conductor system between Maybole and Coylton with a 18km 132kV double circuit overhead lune using L7 towers and twin UPAS conductor.

The drivers behind this project (ref TORI-3062) entail:

- Facilitate the connection of new renewable generation in the South-West of Scotland (267.4MW);
- Support SP Distribution in the forecasted increase in demand from the distribution network.

The non-load drivers behind this project entail:

- Replacement of the existing X Route conductor due to recent external assessment of the current condition of the asset
- Replacement of N, CD and CG Route towers in order to accommodate the use of a higher capacity conductor system

This scheme will allow SP Transmission (SPT) to undergo replacement and reinforcement works on the four routes that make up the circuits between Maybole, Coylton and Kilmarnock South; N, CD, CG and X Routes. Due to the increase in the contracted generation in the area, the circuits between Maybole-Coylton-Kilmarnock South are required to be uprated to accommodate this increase in capacity. The conductor on X Route, from Coylton substation to the tee off with N Route, has also been identified as being in need of replacement within the RIIO-T3 period due to the current condition of the asset. It is therefore proposed to reconductor X Route with HTLS Eagle conductor and to rebuild N, CD & CG Routes with L7 towers and 132kV twin UPAS conductor to provide a similar rating to the new X Route conductor. The works to reconductor X Route are scheduled to be completed first to address the current condition of the existing conductor within the RIIO-T3 period, followed by the rebuild works for N, CD & CG Routes.

The expected project delivery date for the works on X Route is October 2031 and the expected project delivery date for the works on X Route is October 2034. The projected cost for the project is £91.75m

This EJP is submitted for Ofgem's assessment of the need case for the project and the selection of the preferred option in order to provide sufficient funding for pre-construction and early construction activities. A cost assessment submission will be made to Ofgem at an appropriate time using the Load Related Reopener within the RIIO-T3 period.

2. Introduction

This EJP supports the proposal as set out under SPT-RI-3062 which is to reconductor the existing X Route and to carry out a full replacement of N, CD and CG Routes with new 132kV steel tower double circuit routes beginning during the RIIO-T3 period and continuing into RIIO-T4. This EJP covers both non-load and load drivers to undertake works across the four Overhead Line (OHL) Routes mentioned above. The non-load aspect comes from condition information for the routes whilst the load aspect comes from recent contracted connection applications in the area which are driving the need to increase the thermal capacity of the circuits.

N, X, CD and CG Routes are 132kV OHL that create the connection between Coylton 132kV and Maybole 132kV substations, spanning a total length of approximately 22.5km. The circuits also consist of a single circuit tee off to Kilmarnock South on N Route; totalling an additional length of 15km with a 4.5km cable section.

In the area surrounding the Coylton, Maybole and Kilmarnock South substations, there has been an increase in the number of contracted generators scheduled to connect during the RIIO-T3 period that require an increase in the capacity of the X, N CD and CG Routes, detailed within SPT-RI-3062, as enabling works. In order to accommodate these contracted generators the capacity of the existing electrical infrastructure needs to be increased. Ensuring that these routes are uprated to an appropriate capacity in order to accommodate these new connections, is therefore vital in ensuring SP Energy Networks continues to work towards achieving the Scottish Government target of reaching Net Zero by 2045. This reinforcement will also support future growth in contracted generation in the SPD network, allowing SPT to provide the necessary capacity uplift to accommodate the establishment of a new/increased capacity at an existing GSP when the necessary demand is met. It should be noted that SPD have recently proposed the replacement of existing 30MVA grid transformers at Maybole GSP with 90MVA units to accommodate new connections in the area.

Aerial condition assessments were carried out on N and CD Routes in September 2018 and January 2019. These condition assessments revealed deterioration in the condition of the insulators and earthwire fittings requiring intervention. In 2019 insulators and earthwire fittings were replaced on both N and CD Route as a result of these assessments.

The 2019 assessment of CG Routes showed the onset of deterioration of the polymeric insulator sets. Due to concerns over the longevity of these insulators they have been planned for replacement in RIIO-T3 to ensure circuit reliability. The condition of CG Route's insulators is such that short-term intervention is required. It is not considered to be practicable to defer this intervention because of the timescales associated with the consenting and construction of the replacement overhead line.

In 2018 conductors recovered from the decommissioned section of N Route were analysed and showed degradation to the steel core indicating a remaining life of 10-15 years for the earthwire and 15-20 years for the phase wire.

Recent intrusive assessment of the conductor on X Route, carried out in September 2022, indicated the need for intervention due to the deterioration of the conductor along the route. The conductor disassembly showed significant aluminium strand corrosion with the beginning of the failure of the galvanic protection on the steel core. The conductor strands failed torsional tests by a significant

margin indicating fatigue of the conductor system. The report suggested that the conductor had a remaining life of 5-10 years.

Due to the conductor condition on N and X Route, condition driven interventions on both routes were planned in RIIO-T3 to ensure the ongoing reliability of these circuits. However, this work has been superseded by the requirement for a higher rating driven by SPT-RI-3062.

Due to the short remaining lifespan on the X Route conductors, SPT are considering a staged approach to SPT-RI-3062. This would involve reconductoring X Route with HTLS to alleviate the immediate condition issue while allowing the route selection and planning process to proceed for the replacement of N, CG and CD Routes.

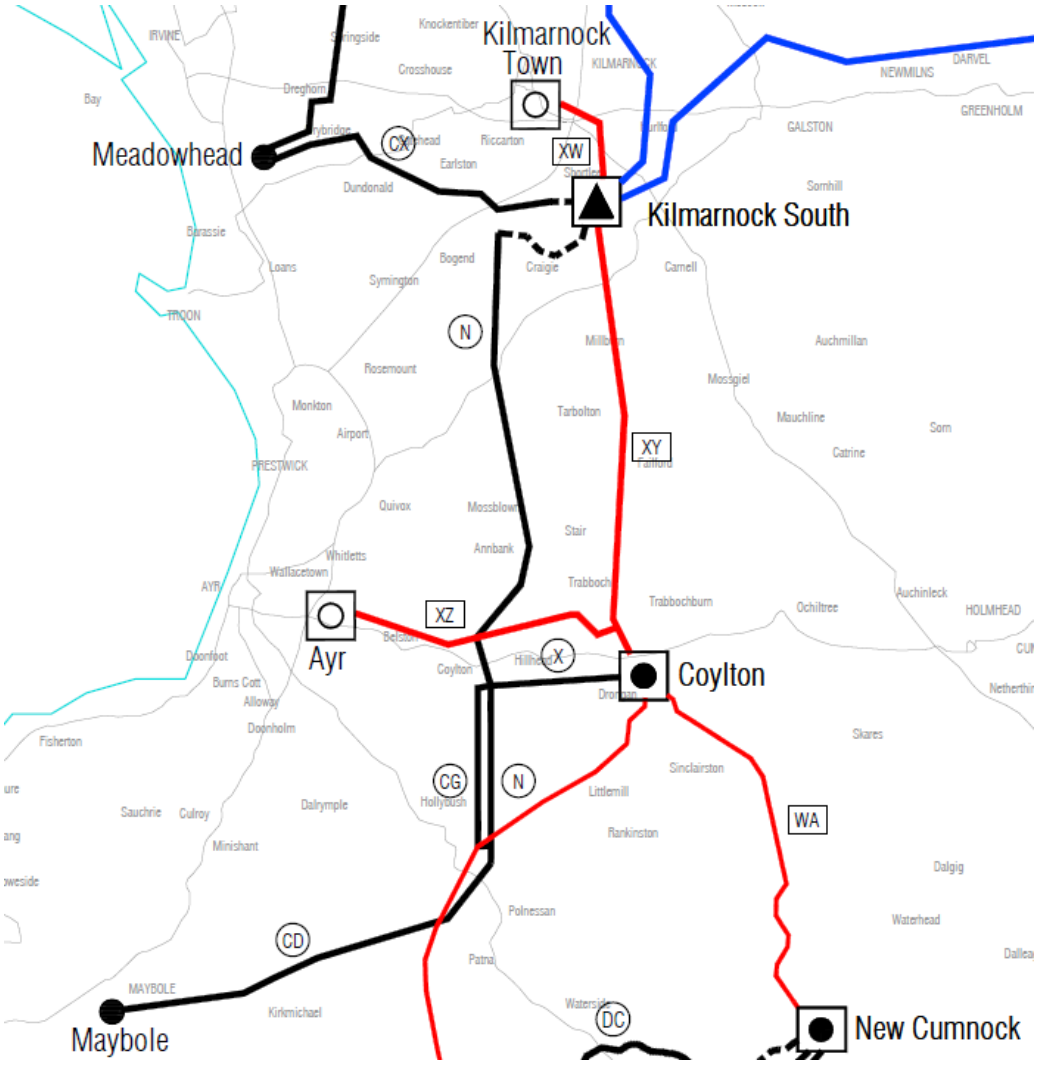

Figure 1: X, N, CG and CD Routes extract from Networks Diagram Geographical Layout

This EJP is submitted for Ofgem's assessment of the need case for the project and the selection of the preferred option in order to provide sufficient funding for the pre-construction and early construction activities. A full cost submission will be made at the appropriate time.

3. Background Information

The two 132kV circuits between Maybole and Coylton consist of a mixture of double circuit tower lines, single circuit tower lines, single circuit wood pole overhead lines and also incorporates three underground cable sections, with a total length of 22.5km. One side of the double circuit, at the junction between X, CG & N Routes, features a single circuit tee off to Kilmarnock South which is a continuation of N Route, totalling 15km in OHL and 4.5km in UGC.

X Route consists of a 132kV double circuit OHL which runs from N/CG Routes at a junction tower into Coylton 132kV substation via an underground cable. The total length of the circuit consists of approximately 4.37km of OHL with a 0.27km underground cable, totalling 4.64km. The route uses 175mm^2 ACSR Lynx phase conductors with a rating of 89MVA supported by 18 PL16 & L4m towers constructed in 1961. The route begins at the tee junction with the N/CG Routes to the east before diverting north-east later in the route. The route is largely across agricultural land but does pass along the edge of the town of Drongan and crosses train tracks at two points.

CG Route is a 132kV single circuit using 175mm^2 ACSR Lynx conductor rated at 89MVA. The route consists of wood poles constructed in 1980 with one tower at the tee point with X Route totalling a length of 5km. The route runs parallel to N Route, primarily through agricultural land, from the tee junction at tower N098 travelling north to the tee junction with X Route at tower X300.

N Route, installed in 1961 using 175mm^2 ACSR Lynx conductor rated at 89MVA, is also a 132kV majority single circuit, with two double circuit sections between N098 to N100A & N239 to N240. This route consists of 92 steel lattice towers. N Route uses 'Horse' earthwire conductors and all glass insulators installed in 1961 apart from tower N019 which was installed in 2012. This route consists of part of the connection between Maybole and Coylton, with CD, CG and X Routes, as well as consisting as part of the connection between Maybole and Kilmarnock South. The route begins from the tee junction with CD Route and travels north to the tee junction with X Route at tower X300 before continuing north to Kilmarnock South where it enters the substation through a 4.5km underground cable. The total OHL length for N Route is approximately 20km. Between towers N70 and N69, the route passes under XZ Route, a 275kV double circuit OHL.

CD Route consists of a 132kV double circuit OHL route, constructed in 1971, using 175mm^2 ACSR Lynx conductor rated at 89MVA consisting of 46 steel lattice towers of PL16 and PL4 design forming part of the connection between Maybole and Coylton. The route spans from the tee junction at tower N098 and terminates directly into Maybole 132kV substation via an OHL and spans an approximate total length of 13.11km.

Information about the existing X, N, CD & CG Routes and the proposed options are summarised below.

Table 1: Existing X, N, CD & CG Routes Background and Proposed Options

System Design Table	Circuit / Project	**Option 1 Baseline:** *Do Nothing / Minimum*	**Option 2:** *Reconductor all Routes HTLS conductor 132kV RIIO-T3*	**Option 3:** *Full replacement L7 Towers 132kV and twin UPAS RIIO-T3*	**Option 4:** *X Route Conductor Replacement and Full Replacement of N, CD & CG with 132kV L7 Towers RIIO-T3*
Thermal and Fault Design	Existing Voltage *(if applicable)*	132kV	132kV	132kV	132kV
	New Voltage	N/A	132kV	132kV	N/A
	Existing Continuous Rating *(if applicable)*	89MVA @ 50ºC *(Summer Pre-fault)*	89MVA @ 50ºC *(Summer Pre-fault)*	89MVA @ 50ºC *(Summer Pre-fault)*	89MVA @ 50ºC *(Summer Pre-fault)*
	New Continuous Rating	N/A	295MVA @ 75ºC *(Summer Pre-fault)*	352MVA @ 75ºC *(Summer Pre-fault)*	295MVA @ 75ºC *(Summer Pre-fault)*
	Existing Fault Rating *(if applicable)*	N/A	N/A	N/A	N/A
	New Fault Rating	N/A	N/A	N/A	N/A
ESO Dispatchable Services	Existing MVAR Rating *(if applicable)*	N/A	N/A	N/A	N/A
	New MVAR Rating *(if applicable)*	N/A	N/A	N/A	N/A
	Existing GVA Rating *(if applicable)*	N/A	N/A	N/A	N/A
	New GVA Rating	N/A	N/A	N/A	N/A
System Requirements	Present Demand *(if applicable)*	38MW	38MW	38MW	N/A
	2050 Future Demand	98MW	98MW	98MW	N/A
	Present Generation *(if applicable)*	N/A	N/A	N/A	N/A
	Future Generation Count	2	2	2	N/A
	Future Generation Capacity	267.4MW	267.4MW	267.4MW	267.4MW
Initial Design Consideration	Limiting Factor	Asset health driven requirement	Limit on future ability to increase capacity through a second circuit due to wood pole rebuild being used	Asset health driven requirement for removal of X Route conductors within the RIIO-T3 period.	N/A

	AIS/GIS	N/A	N/A	N/A	N/A
	Busbar Design	N/A	N/A	N/A	N/A
	Cable/OHL/Mixed	N/A	Mixed	Mixed	Mixed
	SI	N/A	No scope for SI with single wood pole construction and HTLS.	N/A	Selected conductor for new circuit larger than minimum requirement for future reinforcement, and construction of towers instead of wood poles enables additional double circuit in future if required.

3.1. System Reinforcement Drivers

Within the RIIO-T3 price control period, 1st April 2026 – 31st March 2031, there is a significant number of new generation projects contracted to connect to the SPT network, with a large proportion of this new generation comprising onshore and offshore wind and battery energy storage system (BESS).

In the most recent (2024) Future Energy Scenario (FES) developed by the ESO, the Holistic Transition (HT) scenario, formerly the Leading the Way scenario, indicates the connection of 13GW of wind & 3.99GW of battery storage by 2031 in the SPT area at the completion of the RIIO-T3 period. These figures extend to 16.5GW for on- and off-shore wind by 2050, with battery storage remaining at 3.99GW respectively. Based upon the current contracted queue for directly connected transmission connections being significantly greater than the FES requirements, as outlined in the TEC register, it is vital that SPT is proactive in the approach to reinforcement works on the network in order to ensure that it is adequately prepared to accommodate the connection of this capacity.

In December 2023, the NESO published the Final Recommendations Report for Connections Reform, scheduled to become live in January 2025. In advance of the publication of the Connections Reform, the view on probability of new connections project going ahead, giving the SPT 'Best View' has been informed for RIIO-T3 planning by the TECA (described in section 2.1.2 below), which uses similar criteria to assess new connection drivers.

Furthermore, on the 4th November 2024, NESO published the 'Clean Power 2030' paper, as advice to the UK Government on how to achieve a low-carbon power system by 2030; where demand is met by clean sources (primarily renewables) with gas fired generation only to be used to ensure security of supply (primarily during periods of low wind). While subject to a decision by the UK Government, this publication reaffirmed the need to continue to invest in the wider transmission network to ensure that 2030 and later targets are met.

3.2. SP Distribution Support

During the RIIO-T3 period there is forecast to be an increase in the amount of generation and demand connections to contract to the SP Distribution (SPD) network. This is forecast to result in a respective increase in the number of fault level, demand and generation constraints at the distribution level and therefore requiring subsequent works by SP Transmission for any constraints this would have on the transmission system across the SP Transmission area. These constraints are based on the DFES forecast under Baseline and High View, with respect to accepted generation and demand connections scheduled to energise during the RIIO-T3 period. One of the areas that is forecast to require SP Transmission works before April 31st, 2031, in order to alleviate fault level, demand and generation constraints, is the area surrounding Maybole, Coylton and Kilmarnock South substations, as seen in Figure 2 below.

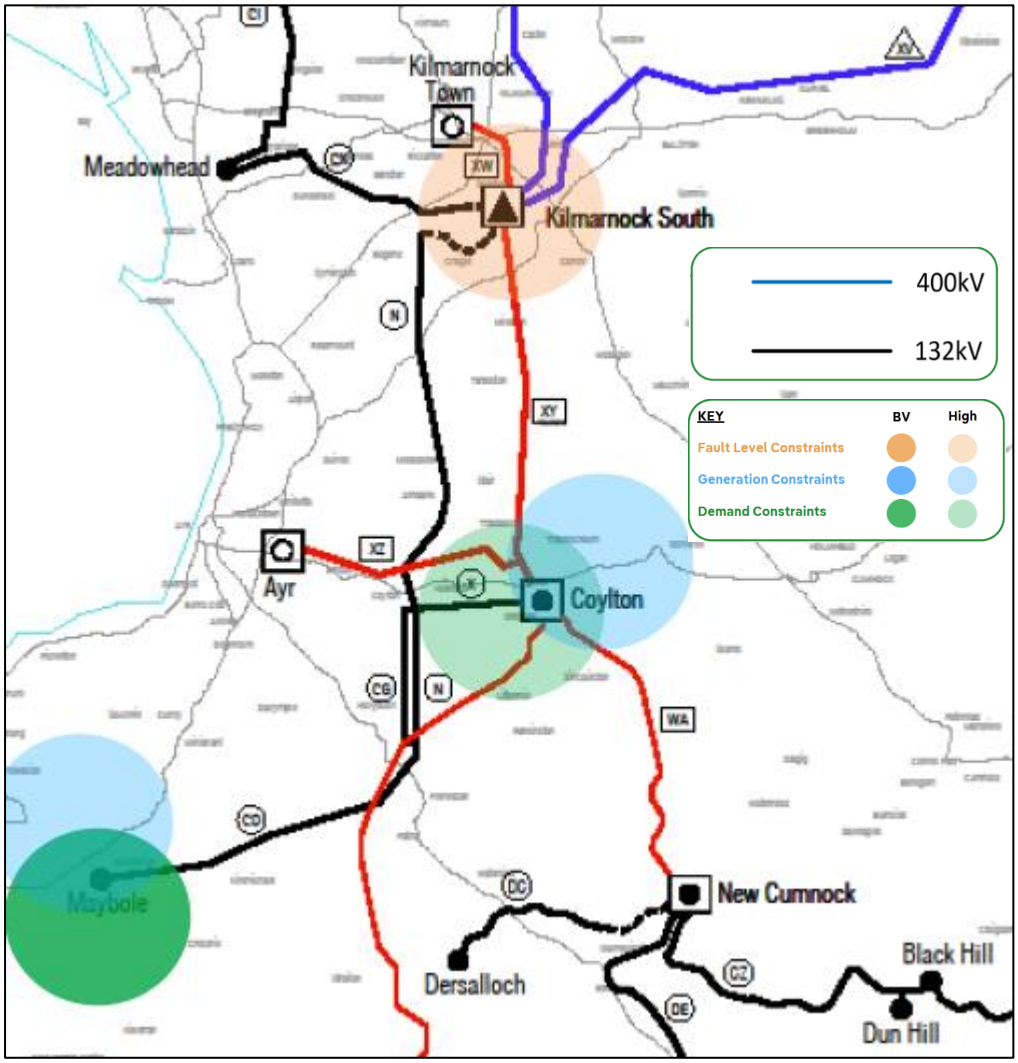

Figure 2: SPD Fault, Generation and Demand Constraints

As shown in the graphic, there are significant constraints surrounding each of the substations affected by the transmission reinforcement works detailed under SPT-RI-3062. The reinforcement works covered in this EJP will enable SPT to further support SP Distribution in the area. SP Distribution are projecting the need to replace the existing two 30MVA Grid Transformers at Maybole GSP with larger 90MVA units. This is to support an increase in demand in this area but will also facilitate generation connections.

The current forecasted demand, using data from the most recent DFES 2023 publication, to connect to Maybole GSP within the RIIO-T3 period and beyond to 2040 is presented below, given the current GSP capacity of the existing 30MVA transformers. It is noted that the forecasted demand for Maybole GSP is expected to increase by 60% by the end of the RIIO-T3 period and will increase by a further 50% from the end of RIIO-T3 to 2040. This will provide an overall increase of 140% in demand at Maybole GSP from 2024-2040.

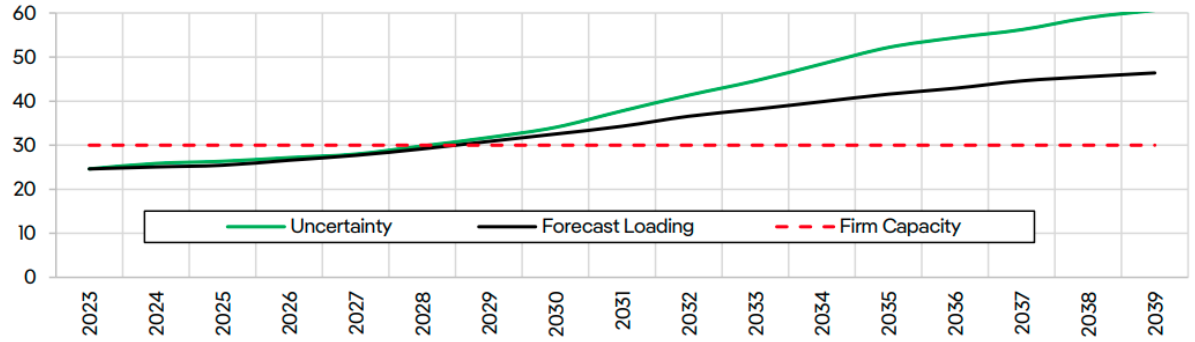

Figure 3: Maybole GSP DFES Forecast Firm Demand (MW)

The planned growth as noted in the DFES data above coupled with the contracted generators planned to connect to the SPT system, as per Section 2.1.2 below, would require SPT to size any reinforcements appropriately to accommodate all developments.

3.2.1 New Generation Connections

A Bilateral Connection Agreement is in place between NESO and the developers of the generation projects detailed in Table 2 below. In each case, SPT-RI-3062 is identified as enabling works corresponding to Transmission Owner Construction Agreements (TOCAs) that are in place between NESO and SP Transmission (SPT).

Table 2: Contracted Connection Background & TECA Score

[redacted]

Total Capacity (MW)	-	-	-	**267.4**

During the process of identifying and evaluating options for each connection offer, due regard was given to the development of an efficient, coordinated and economical system of electricity transmission. As well as determining the most appropriate connection location and connection method (e.g. overhead line, underground cable, wood pole vs steel tower, connection voltage etc).

As a part of the RIIO-T3 load planning strategy, SPT has developed a probability scoring system, in order to score directly connected transmission projects based on parameters that will indicate their likelihood to connect to the network by their intended connection date, to inform requirements of network reinforcements. By utilising this tool, a portfolio of generation connections that have a high probability of connecting to the network in the near future can be built, enabling SPT to take a proactive approach when considering future reinforcement works on the network. Areas that have a significant number of generation connections scheduled to connect to the network, with a corresponding high probability score, has helped to shape the SPT RIIO-T3 plan.

The methodology of the scoring system splits the overall score into 4 separate categories, each of which carry a different weight regarding the final score and which take into account aspects that are specific to individual projects and the technology as a whole. The four categories are as follows:

- Technology
- Technology Maturity
- Developer Track Record
- Planning Status

The data presented indicates that both of the projects that have SPT-RI-3062 as enabling works are likely to connect to the network, based on the medium probability score that both demonstrate. This would indicate an increase of 180.4MW of capacity being added to the network that have SPT-RI-3062 as enabling works.

Given the targets set by the Scottish government to reach net zero by 2045, it is vital that the necessary electrical infrastructure to support the connection of new renewable generation is completed within the upcoming RIIO-T3 period and beyond. The completion of infrastructure projects, such as the proposal outlined in this document, will provide the necessary increase in capacity required to support these projects and will ensure continuity of connectivity through providing a robust and stable infrastructure to support the circuit.

3.3. Asset Conditions

The sections below outline the conductor and visual assessments carried out across X, N, CD and CG Routes.

3.3.1 X Route Conductor Assessment

Records show that both the phase and earth conductor were installed in 1961. A phase conductor sample was taken in 2022 which showed significant reduction in ductility, corrosion of inner aluminium strands and the onset of failure of the galvanic coating on the steel core. Cormon testing was also carried out during this outage which showed high values of both possible and partial corrosion. The conductors are therefore CR5 with a predicted remaining lifespan of 5-10 years from sample date. The earthwire conductor has not been tested however the degradation of horse vs lynx ACSR is well understood and therefore the condition of the earth conductor can be predicted to be worse than the lynx phase conductors. Both the phase conductors and the earth conductor are considered CR5 'end of serviceable life' as per OHL-01-014 and need replaced.

3.3.2 X Route Visual Condition

The towers on X Route were visually assessed by EA Technology in 2018 as part of the routine condition assessment programme. This assessment noted one circuit had been painted relatively recently while the other circuit was showing areas of rust and primer showing through the paintwork. No bent or damaged bars were noted. Both circuits were subsequently programmed for painting in RIIO-T2.

3.3.3 N Route Conductor Assessment

Records show that both the phase and earth conductor were installed in 1961 however phase conductor samples gathered from the decommissioned section of N Route indicate that the conductor is fully greased and has an anticipated 15-20 years of service remaining (2018 test date). This would suggest that the original phase conductors installed in 1961 have been replaced some time after with no existing records of when it was installed. Earthwire conductor samples were also gathered in 2018 with results indicating significant debris ingress and hardening/discolouration of the grease with evidence noted of widespread corrosion of the internal steel wires galvanic zinc coating and loss of ductility suggesting the earthwire conductor is approaching end of life.

3.3.4 N Route Visual Condition

The towers on N Route were visually assessed by EA Technology in 2018 as part of the routine condition assessment programme. This assessment noted a number of towers with damaged/bent bars which were assigned a rating of CR5. Towers throughout the route were noted to require painting with rust breakthrough noted below the paintwork in some instances. Insulators and fittings were also noted to be worn and corroded. In 2019/2020 all insulators were replaced and all towers on N Route were painted.

3.3.5 CD Route Conductor Condition

Records show that the conductors on CD Route were installed in 1971. A phase conductor sample was taken in 2023 which showed no significant degradation and estimated the remaining life of the conductor to be 15-20 years.

3.3.6 CD Route Visual Condition

CD Route was visually assessed in 2019 by Cyberhawk. This assessment showed severely corroded suspension insulators which were replaced later that year due to concerns over their mechanical

integrity. Tower corrosion was noted on one circuit and this was subsequently painted during re-insulation work.

3.3.7 CG Route Visual Condition

CG Route was visually assessed in 2019 by Cyberhawk. This assessment showed concerning degradation of the polymeric insulators with 70% of the insulators being scored as CR3. Insulators are degrading at the pole end with sheds visibly eroded. The cause is currently unknown however it is potentially due to damage from birds. Poles were visually inspected and hammer tested by Transmission Operations in 2023 with no degradation noted at any poles. No conductor sampling has been undertaken on CG Route.

4. Optioneering

This section provides a description of each option for the Coylton – Maybole route uprating and details the key considerations that were taken into account in proposing or discounting each proposal. A summary of each option is described at the end of this section, with the selected option highlighted and an in-depth review provided. At a high level the options considered were:

1. Non-Load Intervention Works Only
2. Reconductor X and CD Routes with HTLS conductor and rebuild N and CG Routes with trident wood pole structures and HTLS conductor
3. Full rebuild of all routes (X, N, CD and CG) with an L7 steel tower and twin UPAS conductor system.
4. Reconductor X Route with HTLS conductor and rebuild remaining routes (N, CD and CG) with an L7 steel tower and twin UPAS conductor system.

4.1. Option 1: Baseline - Non-Load Intervention Works Only

A 'Non-load intervention works only' option has been considered to represent the ongoing maintenance and repair as part of business as usual. This option involves the minimum level of intervention that is required to remain compliant with all relevant safety and legal regulations. The works that would be included under this option would be the reconductoring of X Route and the replacement of the earth wire on N Route. The ACSR Lynx conductor currently in service on X Route would be replaced with Sycamore. Despite AAAC Poplar being the direct replacement for Lynx conductor, the increased rating obtained relative to the minor incremental cost of Sycamore conductor is considered to be the optimal intervention as it provides the maximum rating on this tower construction type. The works would ensure the required short term non-load intervention on the route is completed.

This option is considered to be unacceptable . as it would not provide the necessary capacity uplift required to accommodate the contracted generation forecast to connect in the area. However, it is noted that intervention would remain necessary in the absence of load-related drivers. This option is therefore, not credible in relation to this project and would be inconsistent with SPT's statutory duties and licence obligations, including Licence Conditions D3 and D4A, which require SPT to comply with the NETS SQSS and to offer to enter into an agreement with the system operator upon receipt of an application for connection, such offers being in accordance with the System Operator Transmission Owner Code (STC) and associated Construction Planning Assumptions provided by NESO.

4.2. Option 2: Reconductor X and CD Routes with HTLS conductor and rebuild N and CG Routes with trident wood pole structures and HTLS conductor

Given the generation applications in the area that are contracted with SPT, 267MW based on Table 2 in Section 3.2.1, there is a need for a higher rated conductor system to facilitate these connections between Coylton, Maybole and Kilmarnock South substations. The option outlined here proposes to reconductor the COYL-MAYB-KILS circuits (X, N, CD & CG) with HTLS 'Eagle' conductor and any associated sections of 132kV cable to meet the load requirement for the generation applications in this area. The HTLS 'Eagle' conductor would provide a summer pre-fault rating of 295MVA. The existing X Route and CD Route towers would be maintained however the towers on CG and N Routes will need to be replaced as it is not possible to install this conductor system on the trident wood pole structures on CG Route and the PL1 towers on N Route. It is proposed to rebuild CG and N Routes with trident wood pole structures. Works would also be required to uprate the 132kV cable sections in line with the rating of the higher rated conductor system across the routes which are: CD Route (2 off), X Route (1 off) and N Route (1 off).

Figure 4 below shows a single line diagram outlining these works. The works highlighted in yellow aim to show the sections of the routes which would only require reconductoring works with the HTLS Eagle conductor whilst the green elements are noting those that would require to be rebuilt. In this case this would be with trident wood pole structures and HTLS Eagle conductor.

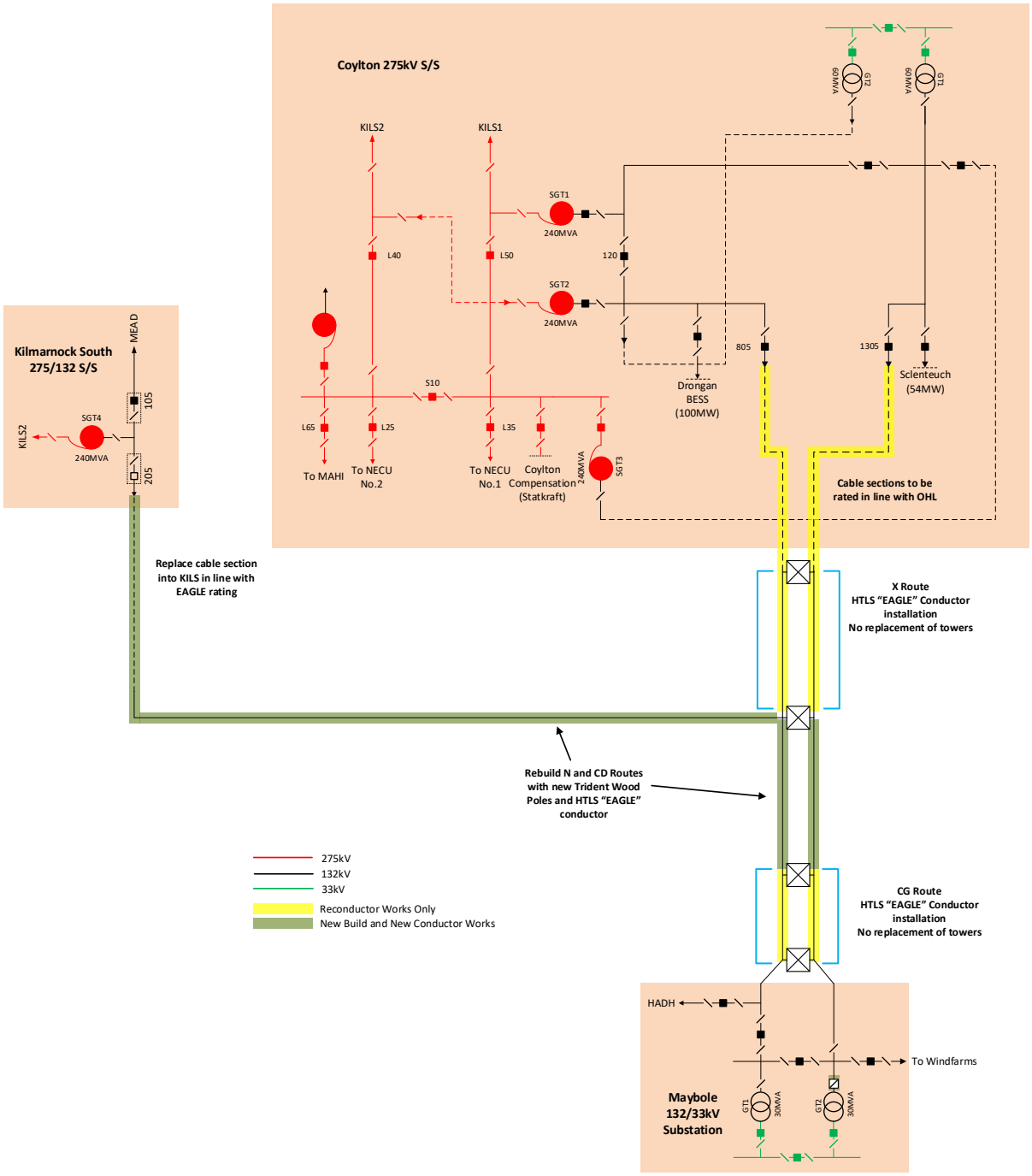

Figure 4: Option 2 Single Line Diagram

The cost associated with this option have been estimated at £65.44m and this is inclusive of, but not limited to the following works:

X Route Works

- Installation of circa 4.4km of HTLS "Eagle" conductor on X Route
- Installation of 0.33km of 132kV 2000mm^2 Cu underground cable (2 cables per phase) into Coylton substation
- Removal of existing X Route conductor system and cable section(s)

N Route Works

- Construction of circa 23km worth of new trident wood pole structures to replace the existing structures
- Installation of circa 23km of HTLS "Eagle" conductor on N Route
- Installation of 0.5km of 132kV 2000mm2 Cu underground cable (2 cables per phase) into Kilmarnock South substation
- Installation of circa 0.2km of 132kV 2000mm2 Cu underground cable (2 cables per phase) to replace the existing YY Route cable dip
- Establishing of two 132kV cable sealing end compounds at the base of each new terminal tower
- Removal of existing towers, conductor system and cable sections across N Route

CD Route Works

- Installation of circa 13km of HTLS "Eagle" conductor on CD Route
- Installation of circa 0.2km of 132kV 2000mm2 Cu underground cable (2 cables per phase) to replace the existing YY Route cable dip
- Establishing of two 132kV cable sealing end compounds at the base of each new terminal tower
- Removal of existing CD Route conductor system

CG Route Works

- Construction of circa 5km of new trident wood pole structures
- Installation of circa 5km of new HTLS "Eagle" conductor
- Dismantling and removal of existing CG route structures and conductor system

Whilst the installation of the HTLS Eagle conductor system across all the routes between Coylton, Maybole and Kilmarnock South would meet the load requirements in line with the currently contracted generation applications in this area, it does not offer appreciable additional thermal headroom particularly when taking into account what was noted in Section 2.1.1 whereby SP Distribution are signalling the requirement to uprate the size of the Grid Transformers installed at Maybole GSP from 30MVA units to 90MVA units. Alongside this project it is anticipated that new embedded applications will come forward.

This option proposes to completely rebuild CG and N Routes given the condition and construction of the existing structures installed on these routes as well as uprate the 132kV cable sections across the N and CG Route cable dips and the N Route cable section into Kilmarnock South. On balance the rebuild of N and CG Routes with new structures as well as replacement of the various cable sections across these routes does not offer the most economic, efficient and coordinated solution when comparing with Options 3 and 4 as outlined below. Given that SPT will need to construct new OHL infrastructure in this area the most coordinated solution would be to establish a new double circuit tower suite rather than simply rebuilding what is there with structures to take the HTLS Eagle conductor. The routing activities associated with a new build line would also enable the cable dips around YY Route to be designed out thus removing costs associated with cable sealing end compounds as well as cable from the solution.

Progression with this option also removes a key strategic option SPT would be able to exercise under both Options 3 and 4 which is to bring an additional 132kV circuit from Kilmarnock South into this group should it be required. The connectivity proposed as part of this option would simply keep a single circuit from Kilmarnock South into the Coylton/Maybole and should these drivers come forward SPT would be required to design, consent, route and construct an additional circuit beside the one outlined in this option.

It is therefore the view of SPT that this option whilst satisfying the contracted connections it may limit the strategic options going forward.

4.3. Option 3: Full Rebuild of Coylton – Maybole & Maybole – Kilmarnock South Circuits

As noted in Option 2 above there is a requirement to facilitate new generation applications in this area of the system in order of the 267MW. This option proposes to rebuild the 132kV circuits between Maybole and Coylton as a double circuit using L7 steel towers with 2x AAAC UPAS conductor system (twin UPAS), giving a summer rating of 352MVA on each side. The tee off to Kilmarnock South will also be replaced with L7 steel towers with twin UPAS conductor installed on one side of the new tower route which will make the rating of the conductor system consistent across the corridor as well as maintain the connectivity to Kilmarnock South and ensure compliance with SQSS Chapter 3 Demand Group compliance. The establishing of the new L7 towers will also provide the opportunity for SPT to establish a second circuit in the future between Kilmarnock South and Coylton/Maybole should this be required.

Figure 5 below shows the single line diagram outlining the works between Coylton, Maybole and Kilmarnock South substations. Under this option all routes and conductor would be replaced.

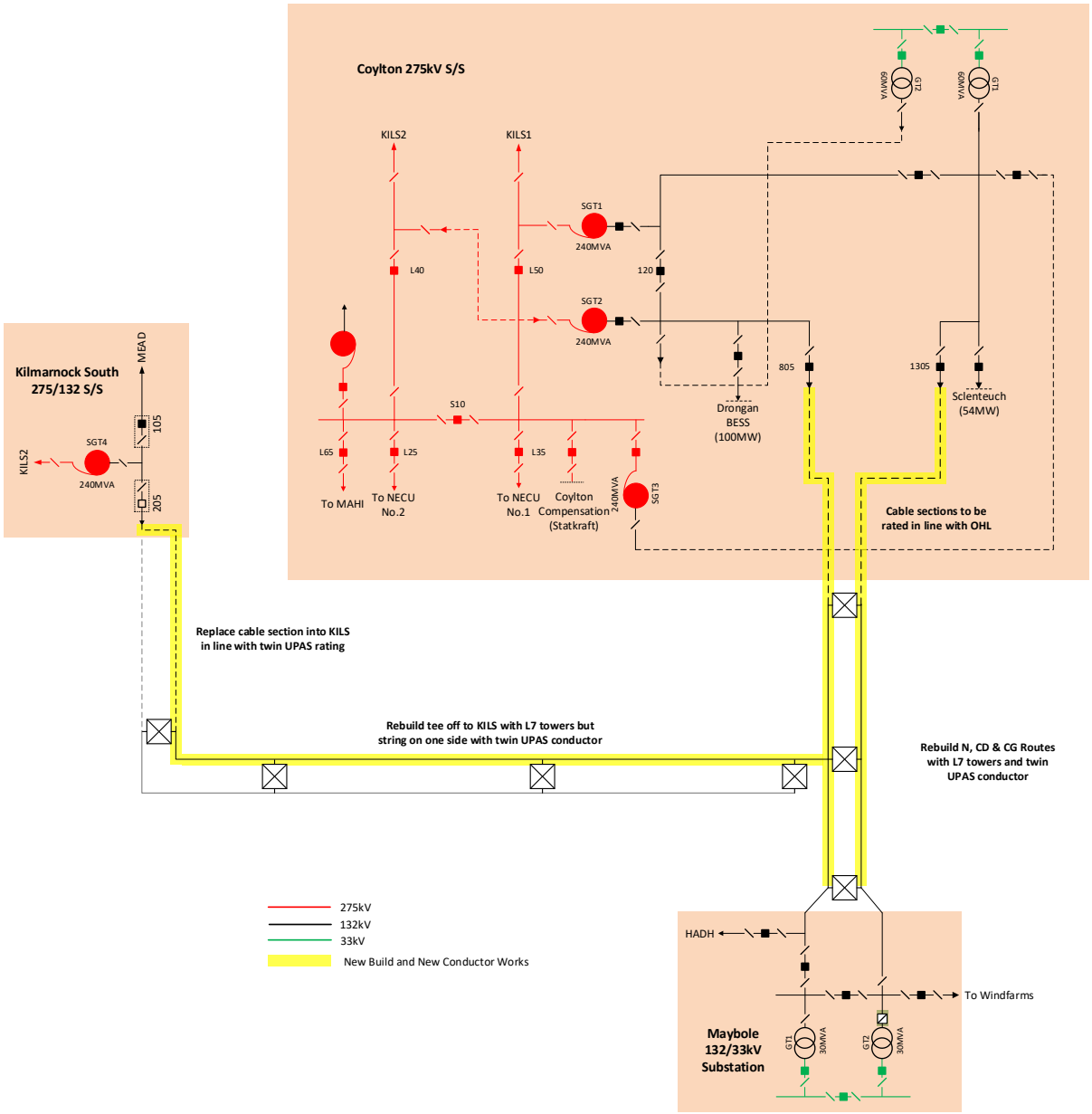

Figure 5: Option 3 Single Line Diagram

The cost associated with this option have been estimated at £93.63m and this is inclusive of, but not limited to the following works:

- Rebuild N, X, CD and CG Routes with L7 steel lattice towers.
- Install twin UPAS 132kV conductor system between Coylton and Maybole substations which is circa 22.3km (route length).
- Install twin UPAS 132kV conductor system between Kilmarnock South and an appropriate tee point to the new L7 towers. This is approximately 18km however note this will only be installed on one side of the new towers.
- Installation of 0.33km of 132kV 2000mm^2 Cu underground cable (2 cables per phase) into Coylton substation
- Installation of 0.5km of 132kV 2000mm2 Cu underground cable (2 cables per phase) into Kilmarnock South substation

- Removal of existing X Route towers, conductor system and cable section(s)
- Removal of existing N Route towers, conductor system and cable section(s)
- Removal of existing CD Route towers, conductor system and cable section(s)
- Removal of existing CG Route towers and conductor system

This option is no longer being considered. Whilst this option meets the requirements of the generation capacity increase required to facilitate the contracted generation in this area it does not address the need to replace the conductor on X Route in the short term, as the full rebuild of the route would require more time for planning consents process. This would leave the conductor on X Route in service beyond its remaining life as determined by intrusive testing. As detailed in section 2.2, it was concluded that intervention was required on the conductor in the immediate future. Progressing this option would delay the replacement of the conductor on X Route beyond the predicated operational lifetime of the asset and has therefore been discounted.

4.4. Option 4: Reconductor X Route using HTLS 'EAGLE' Conductor and Full Rebuild of N, CD & CG Routes using L7 Towers and Twin 'UPAS' Conductors

This option builds on the previously proposed works in option 3, however it is proposed to maintain the existing 132kV X Route towers, instead of replacing them, and SPT would install HTLS Eagle conductor on these towers which would mitigate the risk associated with the existing conductor system on this route. In parallel with the works taking place on X Route SPT would progress with the rebuilding of the remaining N, CD & CG Routes with new 132kV L7 towers, with CD & CG Routes using twin UPAS conductors. The new N Route from the tee point up to Kilmarnock South substation, will be rebuilt with L7 towers and similar to Option 3 twin UPAS conductor would be installed on one side of these new towers. The 132kV cable circuit into Kilmarnock South substation will need to be replaced in line with the higher rated circuits. At the Kilmarnock South end a cable sealing compound will need to be constructed to transition the OHL circuit to cable. A new 132kV cable circuit will be installed from this cable sealing end compound into Kilmarnock South substation which will be rated in line with the OHL conductor i.e. 352MVA.

This proposed option is shown in the single line diagram in Figure 6. The works highlighted in yellow aim to show the sections of the routes which would only require reconductoring works with the HTLS Eagle conductor i.e. X Route whilst the green elements are noting those that would require to be rebuilt. In this case this would be with L7 towers with a twin UPAS conductor system.

The total cost associated with this option is £91.75m and this is inclusive of, but not limited to:

- Installation of 4.3km of HTLS 'Eagle' phase conductor on X Route.
- Install twin UPAS 132kV conductor system on new L7 towers between Coylton and Maybole substations which is circa 22.3km (route length). This is across what is currently N, CD and CG Routes.
- Install twin UPAS 132kV conductor system between Kilmarnock South and an appropriate tee point to the new L7 towers. This is approximately 18km however note this will only be installed on one side of the new towers.
- Installation of 0.33km of 132kV 2000mm^2 Cu underground cable (1 cable per phase) into Coylton substation
- Installation of 0.5km of 132kV 1600mm2 Al underground cable (2 cables per phase) into Kilmarnock South substation
- Dismantling and removal of existing route conductor and existing N, CD & CG Routes including cable sections under YY Route.

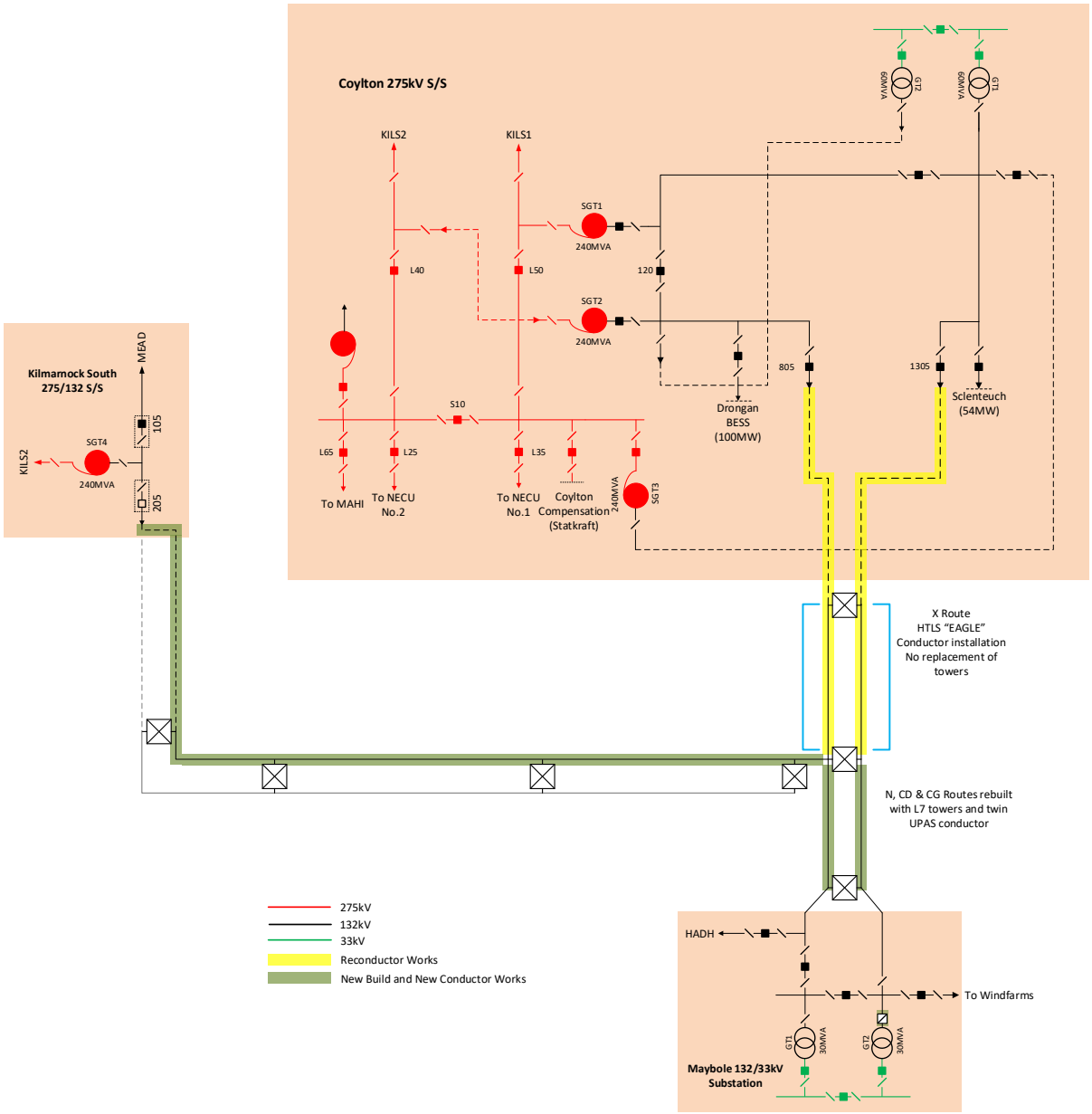

Figure 6 - Option 4 Single Line Diagram Proposed Works

4.5. Selected Option: Option 4: Reconductor of X Route using HTLS 'EAGLE' Conductor and Full Rebuild of N, CD & CG Routes using L7 Towers and Twin 'UPAS' Conductors

Option 4 achieves the main objectives of addressing the current condition of the OHL assets on X, N, CD & CG Routes and provides the necessary capacity uplift to accommodate the connection of new generation in the surrounding area as well as would support the growth expected on the SP Distribution network specifically at Maybole GSP. This option would ensure SPT are developing an economic, coordinated and efficient system as well as provide a strategic option to be exercised should a second 132kV circuit from Kilmarnock South be required into this group which the installation of L7 towers provide.

The works for the commencement of SPT-RI-3062 are scheduled to begin in 2028 with the reconductoring works on X Route, due to complete in 2029. In parallel with these works the consenting exercise will be underway for N, CD and CG Routes with construction scheduled for 2030, with the energisation date for the new 132kV circuits set for 2032. The works to demolish the existing N, CD & CG Routes will begin upon the de-energisation of the circuits and will be scheduled to complete in 2034.

X Route Reconductoring Works

Given the current condition of the OHL conductor on X Route, as specified in section 2.2, intervention is required ahead of the rebuild of N, CD & CG Routes in order to mitigate risk of asset failure due to the conductor condition. The condition of the towers on X Route however is such that intervention is not required in the immediate future. It is therefore planned to reconductor the existing X Route towers with 132kV double circuit HTLS 'EAGLE' conductor.

X Route terminates into Coylton 132kV substation via two cable circuits under YY and WA Routes. These cable sections will be suitably rated to match the new rating of the OHL.

N Route (Tee off Point to Kilmarnock South)

On the spans between the tee off point (current towers X300 / CG001 however this may change when rebuilt) up to Kilmarnock South the same tower suite is proposed to be installed i.e. L7 towers. It is proposed to install twin UPAS conductor strung on one side of these new tower structures. This will keep the single circuit connectivity between Kilmarnock South and Coylton/Maybole whilst also giving SPT the ability to establish a second circuit if required in the future.

At the Kilmarnock South end a cable sealing compound will need to be constructed to transition the OHL circuit to cable. A new 132kV cable circuit will be installed from this cable sealing end compound into Kilmarnock South substation which will be rated in line with the OHL conductor.

Table 3: Options Summary

Options	Map	Layout of Substation/ Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Risks	Narrative Preferred Option	Narrative Rejection
Rejected – Option 1 (Baseline): Non-load intervention works only		N/A	N/A	N/A	N/A	N/A	This option is inconsistent with SPT's various statutory duties and license obligations, reinforcement is required to enable the new connections contracted to connect.
Option 2: Reconductor all circuits with Eagle conductor		N/A	N/A	N/A	N/A	N/A	Construction of wood poles with HTLS conductor does not represent the most economic and efficient solution due to the future requirements for additional infrastructure in the area. (No scope for SI)
Rejected – Option 3: Full Rebuild of Coylton – Maybole & Maybole – Kilmarnock South Circuits		N/A	N/A	N/A	N/A	N/A	Asset condition drivers on X route conductor requires replacing within the RIIO-T3 period, and rebuild of circuit not feasible within this time.
Preferred – Option 4: Reconductor of X Route using HTLS 'EAGLE' Conductor and Full Rebuild of N, CD & CG Routes using L7 Towers and Twin 'UPAS' Conductors		N/A	N/A	N/A	Early engagement with landowners, environmental bodies and employing low bearing pressure ground vehicles and trackway where possible to minimise extents of stone tracks.	This is the proposed option for the project. Replaces the existing X Route conductor in a time frame as which to minimise the asset risk; and offers the highest capacity between Maybole and Coylton as to accommodate new generation in the area. With Strategic Investment in with the future addition of a second circuit on the proposed towers to accommodate future generation and demand growth.	N/A

4.6. Whole Systems Outcomes

It should be noted that our optioneering approach has identified 'Whole System' interactions with other electricity network / system operators (i.e., SP Distribution) in the development of our proposed solution and has considered the appropriate 'Whole System' outcome. This is with consideration that the proposed solution in this EJP, by enabling connection of new renewable generation to the SPT network, reduces the potential congestion volume over the SP Distribution (SPD) network as the DNO responsible in the area.

5. Project Costs

As discussed, the preferred option to provide the most economical and efficient solution to meet all the system requirements is the solution outlined in Section 4.3 and noted as Option 4. Option 4 presents the solution to firstly reconductor X route with HTLS 'Eagle' conductors and then to rebuild N, CD and CG routes using L7 132kV towers with a twin UPAS conductor system.

Due to the current condition of the conductor system on X Route, as presented in section 2.2, intervention is required before the rebuild of N, CD & CG routes will be completed. It is therefore proposed, to ensure that the project is delivered in a timely manner to ensure risk of asset failure is minimised. The works for the commencement of SPT-RI-3062 are scheduled to begin in 2028 with the reconductoring works on X Route, due to complete in 2029. In parallel with these works the consenting exercise will be underway for N, CD and CG Routes with construction scheduled for 2030, with the energisation date for the new 132kV circuits set for 2032. The works to demolish the existing N, CD & CG Routes will begin upon the de-energisation of the circuits and will be scheduled to complete in 2034.

The works for SPT-RI-3062 are as follows:

- Installation of 4.3km of HTLS 'Eagle' phase conductor on X Route.
- Install twin UPAS 132kV conductor system on new L7 towers between Coylton and Maybole substations which is circa 22.3km (route length). This is across what is currently N, CD and CG Routes.
- Install twin UPAS 132kV conductor system between Kilmarnock South and an appropriate tee point to the new L7 towers. This is approximately 18km however note this will only be installed on one side of the new towers.
- Installation of 0.33km of 132kV 2000mm^2 Cu underground cable (2 cables per phase) into Coylton substation
- Installation of 0.5km of 132kV 2000mm2 Cu underground cable (2 cables per phase) into Kilmarnock South substation
- Dismantling and removal of existing route conductor and existing N, CD & CG Routes including cable sections under YY Route.

The thermal ratings for twin conductor 300mm^2 AAAC (UPAS) EHC system thermal ratings* at 75ºC operating temperature:

Table 4: Twin UPAS Conductor Ratings

Season / State	Amps	MVA
Winter Pre Fault	1770	406
Winter Post Fault	2120	482
Spring/Autumn Pre Fault	1690	386

Spring/Autumn Post Fault	2000	460
Summer Pre Fault	1540	352
Summer Post Fault	1830	420

*at 75C Maximum Operation Temperature at 132kV.

Table 5: 132kV HTLS 'EAGLE' Conductor 358mm2 Ratings

Season / State	Amps	MVA
Winter Pre Fault	1340	305
Winter Post Fault	1600	365
Spring/Autumn Pre Fault	1320	300
Spring/Autumn Post Fault	1570	360
Summer Pre Fault	1290	295
Summer Post Fault	1530	350

*at 190C Maximum Operation Temperature at 132kV.

5.1. Estimated Project Costs

A Business Plan provision and estimated cost of the project is indicated in the following table. Costs below are referred as direct, so no risk and contingency nor indirects have been included in the project cost.

Project costs are summarised in the Cost Breakdown below:

Table 6: Cost Breakdown

[redacted]

Total		**91.75**

Expenditure incidence is summarised below.

Table 7: Direct CAPEX Value

Estimated Direct CAPEX value per year, £m, 23/24 price base														
Delivery Year	Yr. 2025: Direct CAPEX	Yr. 2026: Direct CAPEX	**RIIO-T2 Total: Direct CAPEX**	Yr. 2027: Direct CAPEX	Yr. 2028: Direct CAPEX	Yr. 2029: Direct CAPEX	Yr. 2030: Direct CAPEX	**RIIO-T3 Total: Direct CAPEX**	Yr. 2031: Direct CAPEX	Yr. 2032: Direct CAPEX	Yr. 2033: Direct CAPEX	Yr. 2034: Direct CAPEX	**RIIO-T4 Total: Direct CAPEX**	**Total: Direct CAPEX**
2034	0.08	0.23	**0.31**	1.43	3.65	16.62	21.04	**64.07**	21.33	17.77	6.55	3.05	**27.37**	**91.75**

5.2. Regulatory Outputs

The indicative primary asset outputs are identified in table below:

Table 8: Regulatory Outputs

Asset Categories	Asset-Sub Category	Voltage	Intervention	Addition	Disposal
Overhead Tower Line	132kV OHL (Tower Line) Conductor Rating <350MVA	Rating >300MVA & <=400MVA	Addition	54 Km	-
Overhead Tower Line	132kV OHL (Tower Line) Conductor Rating <295MVA	Rating >200MVA & <=300MVA	Addition	4.4km	-
Overhead Tower Line	132kV OHL (Tower Line) Conductor Rating < 89MVA	Rating <89MVA	Disposals	-	54.55km
Overhead Pole Line	132kV OHL (Pole Line) Conductor Rating < 89MVA	Rating <89MVA	Disposals	-	4.56m
Overhead Tower Line	Tower	132kV	Additions	145	
Overhead Tower Line	Tower	132kV	Disposal	-	127
Overhead Pole Line	Pole	132kV	Disposal	-	38
Cable	Circuit Cable – 1 core per phase	132kV	Additions	0.33km	-
Cable	Circuit Cable – 2 core per phase	132kV	Additions	0.7km	-

5.3. Environmental and Consent Works

To rebuild, install and operate the new 132kV OHL circuits of N, CD & CG routes, Section 37 consent is required from the Scottish Government. However, under the Overhead line (Exemption) (Scotland) Regulations 2013, the reconductoring works for X route will be exempt from requiring Section 37 consents. This is due to the works on the route meeting the following criteria layout out in the regulations:

- There will be no change to the existing route.
- There will be no change to the nominal voltage of 132kV for the line.
- Existing steel towers will be used so there will be no change in height of supports.
- Any additional small supports for Overhead Line Conductor and Cable interfaces will not exceed 10 meters in height and will be within 30 meters of the existing support for the Overhead Line Conductor and Cable interface.
- It is currently assumed that there are no protected sites on the existing route.

The Section 37 application for the rebuild of N, CD & CG routes is currently expected to be submitted in June 2028.

The Section 37 application to the Energy Consents Unit will be accompanied by an Environmental Impact Assessment Report (EIA Report). The information contained in the EIA Report will fulfil the requirements of the EIA Regulations and will enable Scottish Ministers as the decision-making authority, to make their decisions on the application for Section 37 consent and deemed planning permission.

The EIA report will detail the findings for the assessment of the likely significant effects of the proposals on the environment in terms of its construction and operation. The assessment forms part of the wider process of EIA, which is undertaken to ensure that the likely significant effects, both positive and negative, of certain types of development are considered in full by the decision maker prior to the determination of an application for Section 37 consent and for deemed planning permission. The main strategy for minimising adverse environmental effects of the proposals will be through careful OHL routeing. Whilst this will avoid some environmental effects other effects are best mitigated through local deviations of the route, the refining of tower locations and appropriate construction practises. Additionally, in certain places, specific additional mitigation measures will be required, which have been undertaken through the EIA process.

6. Deliverability

SPT project management approach has been applied to this project to ensure that this work is delivered safely, and in line with the agreed time, cost and quality commitments. SPT has a proven track record of delivering essential transmission network upgrade projects and will draw upon this knowledge and experience to effectively manage these works. A dedicated Project Manager has been assigned 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.

6.1. Delivery Schedule (Level 1 Programme)

Due to the differing drivers for the reconductor of X route and the rebuild of N. Cd & CG routes, as presented in this EJP, it is proposed to deliver these works separately. This will allow for the reconductor works for X route to be completed within the RIIO-T3 period in line with the non-load

drivers detailed previously in Section 3.2.1 . Table below summarises the key milestones within the delivery schedule.

Table 9: High Level Project Milestones (X Route Reconductor)

Item	Project Milestone	Estimated Completion Date
1	Technical Approval	Mar 2024
2	Financial Authorisation Submission -	Feb 2026
3	ITT Documents Preparation	May 2027
4	Tender Process	Nov 2027
5	Final Financial Authorisation -	July 2027
6	Commence Site Works	May 2028
7	Complete Site Works	Oct 2029
8	Estimated Project Close Out (X Route)	Oct 2031

Table 10: High Level Project Milestone (N, CD & CG Route Rebuild)

Item	Project Milestone	Estimated Completion Date
1	Technical Approval	Mar 2024
2	Financial Authorisation Submission	Nov 2026
3	ITT Documents Preparation	March 2029
4	Tender Process	Nov 2029
5	Section 37 Application Approval	Jun 2029
6	Final Financial Authorisation	July 2029
7	Commence Site Works	Feb 2030
8	Complete Site Works	Oct 2032
9	Dismantling of existing Routes	Oct 2033
10	Estimated Project Close Out	Oct 2034

SP Energy Networks (SPEN) for its procurement process follows a generic global process (INS 00.08.04) for supplier pre-qualification, product technical assessment, manufacturing factory capability assessment and quality audit. The SPEN's equipment approval procedure is to:

- Identify and select candidate equipment
- Ensuring the candidate equipment is assessed to meet the specific requirements of SPEN

- Ensuring a structured and consistent approach is adopted for the approval of candidate equipment prior to energisation
- Ensuring no equipment is installed on SPEN's network without first having been examined in accordance with the procedure and issued a formal internal approval

ASSET-02-002 specifies the SPEN's approval process inclusive of assessment scope and business processes for various equipment.

Regular meetings with the Project and Construction Management Teams shall 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.

6.2. Risk and Mitigation

A Risk Register is generated collaboratively during the initial design stages to identify any risks, which if realised, could result in deviation from the delivery plan. Mitigation strategies are developed to manage the risks identified and these will be implemented by the Project Manager. The risk register shall remain a live document and will be updated regularly. Currently, the top scheme risks are:

- Working over existing distribution overhead lines to be addressed by diverting or undergrounding on a temporary basis.
- Railway and road crossings to be mitigated through scaffolding and traffic management systems or deployment of a catenary support system.
- Utilities within working areas to be addressed through procurement of records for duration of the project.
- Access routes to be addressed through early engagement with landowners, employing low bearing pressure ground vehicles and trackway where possible to minimise extents of stone tracks.
- Network operability/wayleave/environmental restrictions which impact on the progression of works as planned.
- Supply chain for materials and resources.
- X route, current approach to complete under exemption from Section 37, however risk that Section 37 may still be required.
- New route may require public inquiry (CD, CG & N routes), which could incur significant delays, not currently captured within the programme.
- Interface with existing 275kV route (XZ route), which will require a cable dip to navigate.
- Interface with existing YY route can be avoided by re-routing network.

6.3. 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:

6.3.1. 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.

6.3.2. 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.

6.3.3. 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.

6.3.4. 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.

6.4. Environmental and Wayleave Considerations

6.4.1. Environmental Planning

The following environmental surveys will require to be carried out prior to any work commencing on site:

- Ecology: Phase 1 habitat survey
- Ecology: Protected species survey
- Archaeology: Desktop based survey

- Archaeology: Field evaluation*
- Archaeology: Watching brief for any ground-breaking works within identified areas*

**may only be required if any proposed ground-breaking works encroach on areas of interest*

The intention should be to use low bearing pressure vehicles where possible. Access routes and formation may be supplementary to existing roads and tracks and should use sustainable materials which can be reutilised where possible. Any compaction of ground should be rectified.

It is anticipated that surveys on DW Route will identify sites of historical interest and environmental value that will require dialogue with the relevant statutory organisations before work will commence.

6.4.2. Wayleave Issues

The new DW route requires Section 37 consent to operate at 132kV. Any clearance infringement mitigation works, temporary access and working areas required to facilitate physical OHL works will require planning permission from the local planning authority. Landowner agreements will be required to deliver these works. SPT will take a co-ordinated approach to all aspects of these works in view of the need to deliver an overall and integrated solution which recognises potential interaction and cumulative impacts.

6.4.3. Environmental Sustainability

IMS-01-001 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 in line with our Net Zero Science Based GHG target, which is a target of 90% reduction in GHG emissions by 2035 (TBC) from a 2018/19 baseline.
- 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.
- 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.
The proposed design solution is also resilient to future climate change risks, such as substation flooding or potential faults from vegetation along the route.

In SPEN to reduce the number of vegetation related OHL faults, the route will be surveyed, consented, and cut on a per kilometre basis. The cutting specification entails:

- Falling distance plus 5m (i.e., Vicinity Zone) to the conductor and maintain 5 years clear from that distance.
- Clearance as 5.3m to be achieved from conductor positioned at 45° blowout and maximum sag condition. Maintain 5 years clear from that distance.
- All vegetation directly below the OHL with the potential to breach the Vicinity Zone before the next cut cycle shall be removed.
- Hedgerows shall be maintained. Species identified with no threat to breach the Vicinity Zone at any point in the future shall continue to be managed as part of the 3-year vegetation management programme.
- Tower bases shall be kept free of all scrub to a distance of 5m from the base.

OHL-03-080 gives detailed specification for OHL vegetation management in SPEN.

Additionally, the preferred OHL route for the project needs to be identified after extensive evaluation of the length of route, biodiversity and geological conservation, landscape and visual amenity (including recreation and tourism), cultural heritage, land use, forestry, and flood risk.

If routing the OHLs in areas of forestry the guideline is to -:

- Avoid areas of landscape sensitivity;
- Not follow the line of sight of important views;
- Be kept in valleys and depressions;
- Not divide a hill in two similar parts where it crosses over a summit;
- Cross skylines or ridges where they dip to a low point;
- Follow alignments diagonal to the contour as far as possible, and;
- Vary in the alignment to reflect the landform by rising in hollows and descending on ridges.

The overall project design objective is to minimise the extent of felling required and woodland areas and individual trees are to be avoided where possible during the routeing phase. Where routeing through woodland has been unavoidable, a ‘wayleave’ corridor is required for safety reasons to ensure that trees do not fall onto the line and for health and safety of forestry operatives. SPEN has statutory powers to control tree clearance within the wayleave corridor. Where possible the design of the new OHLs and associated infrastructure must be sought to avoid/minimise felling where possible, when balancing with other technical and environmental objectives.

7. Eligibility for Competition

Under the RIIO-T3 Business Plan Guidance, Ofgem has requested that projects that are above £50m and £100m should be flagged as being eligible for being suitable for early and late competition respectively. This project is above the £50m threshold, however, is not suitable due to:

- A number of new connections projects are dependent on the completion date, therefore delays through any project tender exercise will delay these projects.
- The works are to reconductor/replace existing transmission circuits which provide connection to both existing demand and generation customers and are therefore not identified as separable. The project cannot be split to remove separable elements.

8. Conclusion

This EJP sets out the need to undertake reinforcement works on the N, CG, CD and X Routes between Maybole, Coylton and Kilmarnock South 132kV substations in the South West of Scotland. These reinforcement works will act as enabling works for the connection of 267.4MW of new renewable generation in the area, providing the necessary capacity uplift to enable these connections. These works will also provide the necessary support required to SPD as connections increase over the RIIO-T3 period and beyond given the proposed works to upgrade the Grid Transformers at Maybole GSP.

Additionally, the proposed solution for these works will allow SPT to replace existing N, CD & CG routes of which the existing assets have been demonstrated, through external analysis and internal review, to be in need of replacement in the near future. N, CD & CG routes will be replaced with 132kV L7 towers and a twin UPAS conductor system. The solution will, however, maintain the existing X Route towers which have been demonstrated to be in good condition and not in need of replacement at this time, opting to reconductor the route with HTLS 'Eagle' conductor as the condition of the conductor system on this route has been demonstrated to be approaching end of life and is in urgent need of replacement.

The main conclusions of this EJP are:

- The investment in the replacement and reinforcement of the Maybole-Coylton-Kilmarnock South circuits is necessary to provide the required capacity uplift to enable the connection of 267.4MW of renewable generation in the area
- The method of the proposed solution for these works of maintaining the existing X Route towers and reconductoring the route with HTLS 'Eagle' conductor and rebuild N, CD & CG Routes with L7 towers and a twin UPAS conductor system which is seen as the most economic, efficient and coordinated solution of those presented in this EJP
- The expected project delivery date is October 2034 and the estimated project cost is £91.75m.

This paper is submitted to Ofgem for the approval of needs of the project to enable provision of preconstruction and early enabling works funding. A full cost assessment submission will be made to Ofgem within the RIIO-T3 period via the Load Related Reopener at an appropriate time.