MSIP Re-opener Application Stage 1 – SPT-RI-130 - XH and XJ OHL Routes Uprating Works		
Ofgem Scheme Reference/ Name of Scheme	SPT200206 / SPT-RI-130 - XH and XJ OHL Routes Uprating Works	
Investment Category	Wider Works	
Primary Investment Driver	Thermal Uprating	
Secondary Investment Driver	Asset Health	
Licence Mechanism/ Activity	Special Condition 3.14 Medium Sized Investment Projects Re-opener and Price Control Deliverable/ Clause 3.14.6 (c)	
Materiality Threshold exceeded (£3.5m)	Yes, as a single project due to the threshold for activity 3.14.6 (c)	
PCD primary Output	Replacement of the phase conductor on XH and XJ routes with a High Temperature Low Sag conductor system, as part of the major refurbishment of these 400kV OHL routes.	
Total Project Cost (£m)	85.769	
Funding Allowance (£m)	To be confirmed	Requested
Delivery Year	2027/28	
Reporting Table	Annual RRP – PCD Table	
PCD Modification Process	Special Condition 3.14, Appendix 1	

Issue Date	Issue No	Amendment Details
31st January 2023	1	First issue of document.

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1. Abbreviations / Terminology

Table 1: Table of Abbreviations

Abbreviation	Term
AAAC	All Aluminium Alloy Conductor
ACCR	Aluminium Conductor Composite Reinforced
ACSR	Aluminium Conductor Steel Reinforced
AIS	Air Insulated Switchgear
BEIS	Department for Business, Energy & Industrial Strategy
CEC	Connection Entry Capacity
CfD	Contract for Difference
CION	Connection and Infrastructure Options Note
EISD	Earliest In Service Date
ESO	Electricity System Operator
FES	Future Energy Scenario
FNC	Final Needs Case
GIS	Gas Insulated Switchgear
GSP	Grid Supply Point
HND	Holistic Network Design
HTLS	High Temperature Low Sag
HVDC	High Voltage, Direct Current
INC	Initial Needs Case
ITT	Invitation to Tender
Km	Kilometre
kV	Kilovolt
LC	Licence Condition
LOTI	Large Onshore Transmission Investment
LSpC	Licence Special Condition
MSIP	Medium Sized Investment Project
MW	Megawatt
NETS SQSS	National Electricity Transmission System Security and Quality of Supply Standard
NGET	National Grid Electricity Transmission
NGESO	National Grid Electricity System Operator
NOA	Network Options Assessment
OHL	Overhead Line
OTNR	Offshore Transmission Network Review
OFTO	Offshore Transmission Owner
PCD	Price Control Deliverable
OPGW	Optical Ground Wire
RIIO	Revenue = Incentives + Innovation + Outputs
SGT	Supergrid Transformer
SHET	Scottish Hydro Electric Transmission
SPT	SP Transmission
SPEN	SP Energy Networks
STC	System Operator – Transmission Owner Code
UK	United Kingdom
VDUM	Volume Driver Uncertainty Mechanism

2. Reference Documents

Table 2: Table of Reference Documents

Document Reference	Title
SPEN-RIIO-T2_Business_Plan	SP Energy Networks RIIO T2 Business Plan 2021 - 2026
SPNLT20111	XH & XJ Routes 400kV OHL Major Refurbishment

3. Introduction

This MSIP Re-opener application sets out SP Transmission's (SPT) plans to replace the phase conductors on XH and XJ routes with a High Temperature Low Sag (HTLS) conductor system, as part of the major refurbishment of these 400kV overhead line (OHL) routes. The purpose of this project is to facilitate increased power transfer from Scotland to England and ensure timely modernisation of two strategic 400kV OHL routes. The works are programmed to commence in the RIIO-T2 period and complete in 2027/28 (RIIO-T3).

The need to replace the conductor system on XH and XJ routes due to asset health[1], as part of a major OHL refurbishment project, was presented to Ofgem as part of the RIIO-T2 business plan as scheme SPNLT20111[2]. The need was accepted at that time, but due to interaction with load-related drivers, the scheme was subject to a re-opener under Licence Special Condition (LSpC) 3.29.

In the period since the RIIO-T2 business plan was submitted expected increases in onshore and offshore wind generation, supported by the 2021 and 2022 Future Energy Scenarios (FES), confirm the need to deliver significant additional transmission capacity between Scotland and England in the period to the end of the current decade and beyond. This necessitates a significant increase in the thermal rating of the 400kV circuits on XH and XJ OHL routes.

To ensure the electricity transmission system enables a timely transition to Net Zero, in line with United Kingdom (UK) and Scottish Government targets of 2050 and 2045 respectively, asset intervention must be considered in the context of both current and future system requirements. It is vital that the risk of repeated intervention on strategic routes and assets (and therefore repeated system access for construction purposes) is minimised, in particular, where the need for such intervention within the operational lifetime of the replacement asset may reasonably be foreseen.

As part of a major refurbishment project, integrating load and non-load related drivers in an economic, efficient and co-ordinated manner, it is proposed to replace the existing phase conductor on XH and XJ routes[3] with a HTLS conductor system, modernising and significantly increasing the thermal capability of these routes. The proposed HTLS conductor system will help to ensure the network is ready for the changes required by Net Zero targets. Project timing is dictated by: (i) existing asset condition; and (ii) the need for significant additional transfer capability between Scotland and England by the end of the current decade. Scheme SPNLT20111 shall be superseded by this proposal, therefore, a related re-opener application under LSpC 3.29 will not be submitted.

This project was recommended to proceed by National Grid Electricity System Operator (NGESO) as part of the Network Options Assessment (NOA) published January 2022[4] (ref. NOA7 code VSRE). It was identified by NGESO as 'Required for 2027' in the Offshore Transmission Network Review (OTNR) Holistic Network Design (HND)[5] and identified as a 'HND essential option' in the associated NOA Refresh[6] published July 2022.

This MSIP Re-opener application is submitted in accordance with Licence Special Condition (LSpC) 3.14.6 and relates specifically to LSpC 3.14.6 activity (c):

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[1] Excluding the 11.6km Strathaven - Wishaw 400kV circuit on the northern side of XH route.
[2] RIIO-T2 Engineering Justification Paper - SPNLT20111
[3] Including the 11.6km Strathaven - Wishaw 400kV circuit on the northern side of XH route.
[4] Network Options Assessment 2021/22, January 2022
[5] The Pathway to 2030 Holistic Network Design (ref. Appendix 1).
[6] Network Options Assessment 2021/22 Refresh, July 2022

"3.14.6 The licensee may apply to the Authority for a direction amending the outputs, delivery dates or associated allowances in Appendix1 in relation to one or more of the following activities:
(c) a Boundary Reinforcement Project that has received a NOA Proceed Signal in the most recent NOA"

The needs case for intervention on XH and XJ routes and the factors that have an impact on the timing and scope of works are discussed in the following sections. Full justification for the preferred investment option is presented, together with a detailed description of the proposed solution.

The estimated total project cost may be subject to change. As agreed with Ofgem, a second stage MSIP submission will be made at the right time relating to the associated amendments outputs, delivery dates and allowances to be detailed as Price Control Deliverables (PCDs) in LSpC 3.14 Appendix 1.

3.1 Structure of Document

This MSIP Re-opener application is structured as follows:

Section 4 – Background and Needs Case
This section outlines the background to the proposed works and details the key project drivers.

Section 5 – Assessment of Options
This section sets out the approach taken to considering the distinct options available to address the needs identified in Section 4. The results of an evaluation of the alternative options are presented and the reasoning behind the selection of the preferred option is summarised.

Section 6 – Proposed Works
This section provides a description of the proposed solution. It sets out the scope and other key supporting information.

Section 7 – Project Cost Estimate
This section summarises the estimated cost of the selected option.

Section 8 – Project Delivery
This section outlines the approach which will be taken to deliver the project.

3.2 Requirements Mapping Table

Table 3 maps the requirements set out within Chapter 3 of the RIIO-T2 Re-opener Guidance and Application Requirements Document[7] against specific sections within this document.

Table 3: Requirements Mapping Table

Section	Description	Relevant Section(s) in RIIO-T2 Re-opener Guidance and Application Requirements Document
3	Introduction	3.3, 3.4
4	Background and Needs Case	3.8, 3.9, 3.10, 3.11
5	Assessment of Options	3.13, 3.14, 3.21, 3.22
6	Proposed Works	3.14, 3.16
7	Project Cost Estimate	3.12, 3.19, 3.20
8	Project Delivery	3.15, 3.17

[7] RIIO-2 Re-opener Guidance and Application Requirements Document: Version 2

4. Background and Needs Case

4.1 Statutory and Licence Obligations on SP Transmission plc

SP Transmission plc (SPT) is licenced under section 6(1)(b) of the Electricity Act 1989 ("the 1989 Act") to transmit electricity. The licence is granted subject to certain standard and special conditions. Under section 9(2) of the 1989 Act, SPT is required to fulfil the following duty: -

- *To develop and maintain an efficient, co-ordinated and economical system of electricity transmission; and*
- *To facilitate competition in the supply and generation of electricity.*

This statutory duty is reflected in SPT's transmission licence. In addition, SPT has the following obligations pursuant to its licence conditions (LCs): -

- To at all times have in force a System Operator-Transmission Owner Code (STC) which, amongst other things, provides for the co-ordination of the planning of the transmission system (LC B12);
- To at all times plan and develop its transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) and in so doing take account of National Grid Electricity System Operator's (NGESO's) obligations to co-ordinate and direct the flow of electricity on, to and over the GB transmission system (LC D3);
- To make available those parts of its transmission system which are intended for the purposes of conveying, or affecting the flow of, electricity so that such parts are capable of doing so and are fit for those purposes (LC D2); and
- To offer to enter into an agreement with the system operator on notification of receipt of an application for connection, or for modification to an existing connection (LC D4A).

Section 38 and Schedule 9 of the 1989 Act also impose duties on SPT when formulating any relevant proposals. In response to statutory and licence obligations upon it, SPT therefore requires to ensure that the transmission system is developed and maintained in an economic, co-ordinated and efficient manner, in the interests of existing and future electricity consumers, balancing technical, economic and environmental factors.

4.2 Key Project Drivers - Non-Load Related

XH and XJ routes are 400kV double circuit OHL routes that together form a strategic east - west corridor through the central belt of Scotland. Via Wishaw 400kV Substation, XH and XJ routes were constructed in the early to mid-1960s and connect Strathaven 400kV Substation in the west to Smeaton 400kV Substation in the east. Each route is summarised as follows:

- XH Route:
  - 400kV double circuit OHL between Strathaven and Wishaw 400kV Substations;
  - Southern circuit (Strathaven - Torness 400kV) consists of twin Aluminium Conductor Steel Reinforced (ACSR) 400mm^2 'Zebra' (core only greased) phase conductor, installed in 1960;
  - Northern circuit (Strathaven - Wishaw 400kV) consists of twin All Aluminium Alloy Conductor (AAAC) 425mm^2 'Totara' phase conductor, installed in 2014;
  - Earthwire consists primarily (XH003 to XH035) of a single ACSR 175mm^2 'Lynx' (core only greased) conductor installed in 1960;
  - XH route (XH001-XH037A) is supported on 39 steel lattice towers primarily of L2 specification erected in 1960, with an approximate route length of 11.60km.

- XJ Route:
  - 400kV double circuit overhead line between Wishaw and Smeaton 400kV Substations;
  - Southern circuit (Strathaven - Torness 400kV) consists of twin Aluminium Conductor Steel Reinforced (ACSR) 400mm^2 'Zebra' (core only greased) phase conductor, installed in 1966;
  - Northern circuit (Wishaw - Smeaton 400kV) consists of twin Aluminium Conductor Steel Reinforced (ACSR) 400mm^2 'Zebra' (core only greased) phase conductor, installed in 1966
  - Earthwire consists of a single AACSR 190mm^2 'Keziah' equivalent OPGW conductor, installed in 2010;
  - XJ route (XJ001-XJ182B) is supported on 183 steel lattice towers primarily of L2 specification erected in 1966, with an approximate route length of 62.06km.

The RIIO-T2 Engineering Justification Paper for scheme SPNLT20111[8] provides further detail, this scheme having been developed, primarily, to address asset health of the twin 'Zebra' phase conductor on XJ route, the asset health of the twin 'Zebra' phase conductor on the southern side of XH route and the asset health of the single 'Lynx' earthwire on XH route, all of which will be approaching end of operational life by the end of RIIO-T2[9].

The need case for significant intervention due to (non-load related) asset condition considerations was set out and agreed as part of the RIIO-T2 price control process.

LSpC 3.29 provides an uncertainty mechanism which can be triggered to provide funding for non-load related assets interventions. Given the uncertainty around the emerging wider load related requirements at the time the RIIO-T2 price control was being established, and the potential interaction with non-load related requirements, scheme SPNLT20111 ('XH & XJ Routes 400kV Major Refurbishment') is identified as an "Uncertain non-load related" project in LSpC 3.29 Uncertain Non-Load Related Projects Re-opener and Price Control Deliverable Appendix 1.

4.3 Key Project Drivers - Load Related

In June 2019, the UK parliament passed legislation introducing a binding target to reach net zero greenhouse gas emissions by 2050. In Scotland, the Scottish Parliament has committed Scotland to becoming a net zero society by 2045. The timely connection of low carbon generation, such as onshore and offshore wind, will play a vital role in reaching these legislated net zero targets.

The UK Government announced in October 2020 its commitment to make the UK a world leader in green energy and boosted the UK Government's previous 30GW target for offshore wind to 40GW by 2030. The current Scottish Government ambition is 20GW of onshore wind and 11GW of offshore wind in Scotland by 2030. Further commitments, by the UK Government in October 2021, to decarbonise the power system by 2035, as well as British Energy Security Strategy[10] published April 2022 (which raises the UK Government ambition to 50GW of offshore wind by 2030), further support the requirement for investment in the existing electricity transmission system to enable the timely connection and integration of the required renewable generation sources.

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[8] RIIO-T2 Engineering Justification Paper - SPNLT20111

[9] Conductor samples collected from moderately polluted areas over the SPT network indicate that the anticipated life following an ageing profile (internal galvanic corrosion) of a ACSR 'Zebra' (core-only greased) conductor is between 50-60 years. Consideration of this and additional factors including quality, manufacturing, design and fatigue at clamps and spacer locations can accelerate the typical ageing profile of the conductors giving a projection for the conductor approaching the end of the operational life by end of RIIO-T2.

[10] British energy security strategy - GOV.UK (www.gov.uk)

On 9th September 2021, the Department for Business, Energy & Industrial Strategy (BEIS) announced a £265m[11] budget per year for the Contracts for Difference (CfD) Allocation Round 4, which launched on 13th December 2021 and concluded on 7th July 2022. For the first time since 2015, established technologies, including onshore wind, were able to bid. Given lowering technology costs and a favourable subsidy regime, this will support a considerable number of onshore renewables projects to successfully transition from project inception and development through to energisation[12]. The next CfD auction, Allocation Round 5, is due to open in March 2023, with annual auction rounds expected thereafter.

4.3.1 Offshore Wind Connections - ScotWind

The results of the ScotWind leasing process, a programme managed by Crown Estate Scotland to lease areas of the seabed around Scotland for offshore wind farm development, were announced on the 17th January 2022[13]. In summary:

- 17 projects with a capacity totalling 24.8GW were selected out of a total of 74 applications, and have been offered option agreements which reserve the rights to specific areas of seabed.
- A total of just under £700m will be paid by the successful applicants in option fees and passed to the Scottish Government for public spending.
- Initial indications suggest a multi-billion pound supply chain investment in Scotland.
- Of the 17 projects selected in January 2022, 6 are in the ScotWind East region[14] with a combined capacity of 10.5GW and option fees totalling £324.5m, of which 3 are in the East 1 Zone, with a combined capacity of 6.7GW and option fees totalling £199.8m.

Since the announcement of the initial ScotWind leasing results in January 2022, an additional 2.7GW of offshore wind has been leased in an area East of Shetland, taking the total ScotWind generation to 27.6GW.

The ScotWind results underline both the scale of development potential off the north and east coasts of Scotland and the commitment from industry to delivering the investments in energy infrastructure necessary to meet Net Zero targets. Off the north and east coasts of Scotland in particular, there is very high potential for offshore wind generation, in areas illustrated by the BEIS/ Ofgem Offshore Transmission Network Review[15] (OTNR) Generation Map[16].

ScotWind offshore developments are expected to contribute towards the Scottish Government ambition of 11GW of offshore wind by 2030 and make a significant contribution towards 2045 and 2050 Net Zero targets.

It is vital that the onshore transmission system is developed in a timely manner to enable the benefits of ScotWind to be realised and contribute to the Scottish Government's offshore wind ambition of 11GW by 2030.

4.3.2 Future Energy Scenarios

Each year, NGESO produces a set of Future Energy Scenarios (FES) for use by the Transmission Owners (TOs) as network investment planning backgrounds. Through application of the criteria set out in the

11 Biggest ever renewable energy support scheme backed by additional £265 million - GOV.UK (www.gov.uk)
12 BEIS - Electricity Generation Costs (2020)
13 Crown Estate Scotland - ScotWind offshore wind leasing delivers major boost to Scotland's net zero aspirations
14 Sectoral Marine Plan for Offshore Wind Energy
15 Offshore Transmission Network Review
16 OTNR - Generation Map

NETS SQSS, the FES provide an indication of the capacity requirements of the system based upon the potential future connection of generation and changing demand profiles.

The north to south power transfer requirements on all the northern transmission system boundaries increase significantly over the coming years due to the connection of new renewable generation throughout Scotland as part of the energy transition to meet legislated Net Zero targets. This trend is clearly demonstrated by the transfer requirements on the boundary between the SPT and National Grid Electricity Transmission (NGET) areas (Boundary B6).

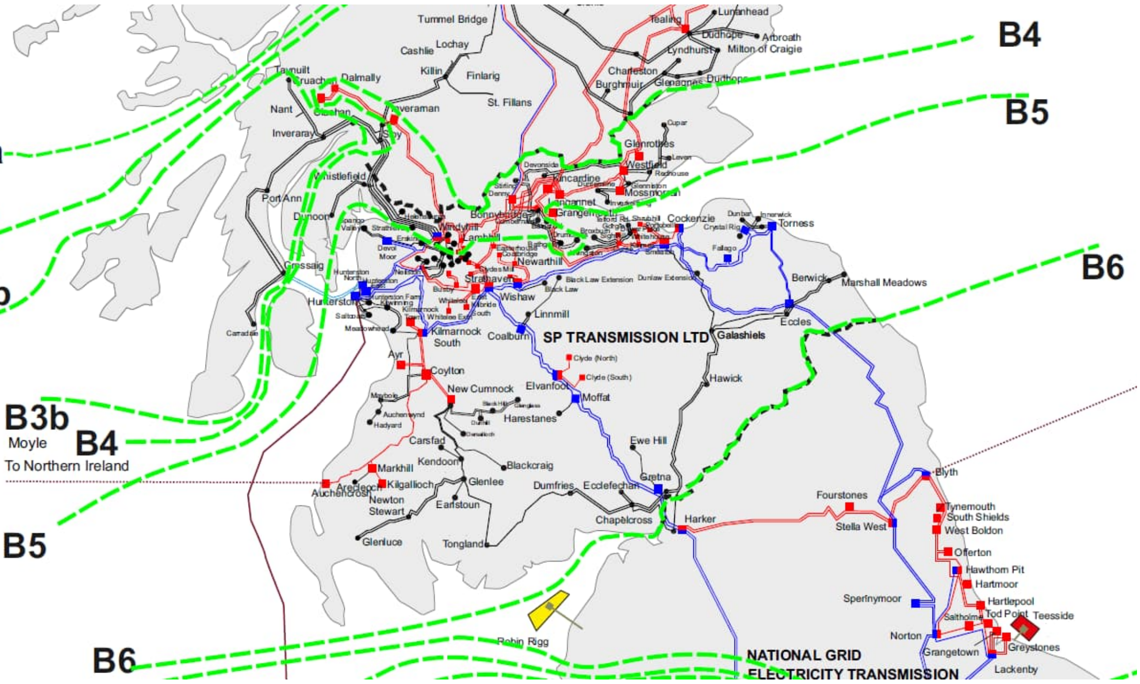

Figure 1 – Network boundaries across SPT's network

Figure 2 indicates the 2021 FES and 2022 FES required transfer capability on the B6 boundary. Existing capability is already exceeded, broadly consistent with all Scotland and North England boundaries, driven by generation developments under the Connect and Manage regime, with the difference becoming extremely pronounced by the mid to late 2020s in all scenarios.

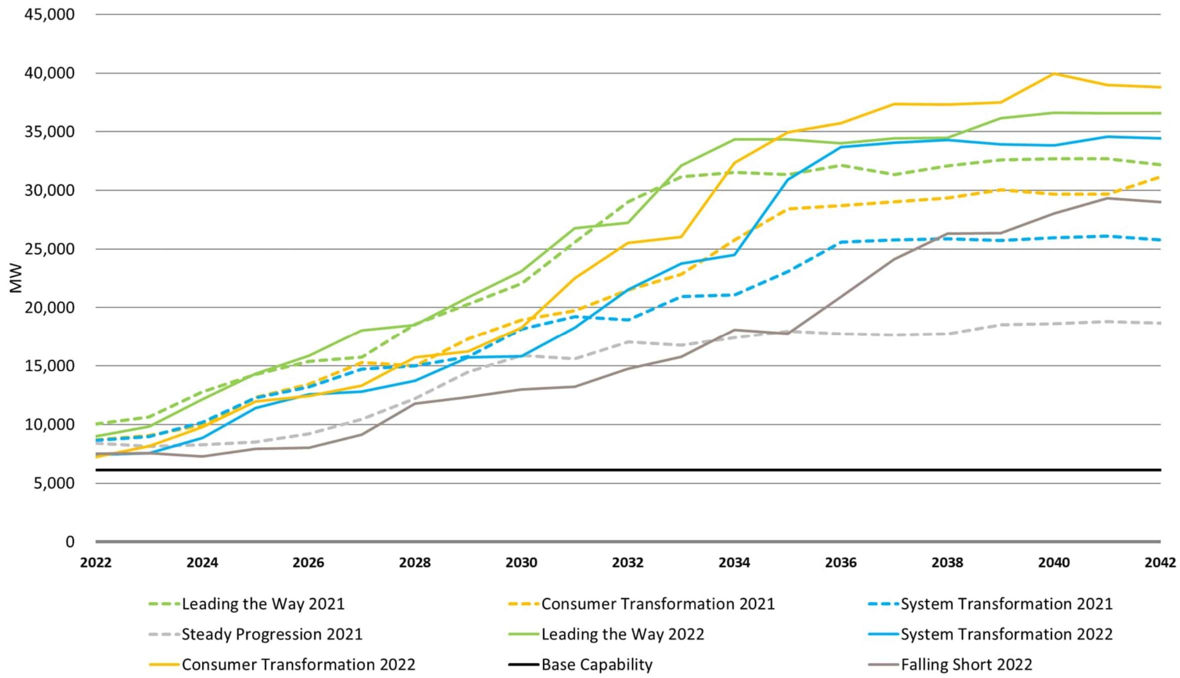

Figure 2: Required Transfers and base capability for boundary B6

The current capability of transmission network boundary B6 is approximately 6,100MW, based on a thermal limitation at [redacted] Figure 2 above shows a required transfer of up to 23GW by 2030 and up to approximately 35GW by 2035.

Figure 2 shows that in the coming years the unconstrained boundary flows on B6 are set to increase significantly. In order to maintain an efficient and economic transmission system whilst economically integrating additional renewable generation, significant system reinforcement is required in an unprecedented timeframe.

4.3.3 Network Options Assessment (NOA)

The Network Options Assessment process (ref. Standard Licence Condition C27) demonstrates the need to make significant investment in the capability of the existing transmission system through Scotland and the north of England to accommodate significant growth in renewable generation. This is required to maintain and operate an economic and efficient transmission system. It is critical that the network is ready to accommodate the scale of projected renewable capacity growth, required to support legislated Net Zero targets, whilst also enabling significant constraint savings.

The 2021/22 NOA Report, published in January 2022, supports the proposal in this paper to progress the replacement and uprating of the conductor system on XH and XJ routes with a HTLS conductor system (ref. NOA7 code VSRE), giving the project a "Proceed" recommendation. This recommendation continued to be supported through the NOA Refresh, published in July 2022.

4.4 Alignment with RIIO-T2 Strategic Goals

As described in our RIIO-T2 plan[17] for the five-years to the end of March 2026, to mitigate the impacts of climate change and achieve a low-carbon energy system requires a level of focused effort and commitment never seen before. The mass electrification of transport and heat has only started and there is a huge amount required to build on the timely progress already made in the electricity sector.

Energy networks are critical to achieving the wider Net Zero emissions targets and with continued engagement with consumers, network users and our wider stakeholders, we've set a progressive plan in place to facilitate a Net Zero future. Our RIIO-T2 plan sets out four strategic goals – informed by our stakeholder priorities – that will keep us moving towards this sustainable future. These goals and their alignment with the uprating and modernisation of XH and XJ OHL routes, are summarised in Figure 3.

Further detail regarding how this proposal aligns to our four Strategic Goals is outlined below:

Take a leading role in delivering a Net Zero future that is consistent with government objectives.

The uprating of XH and XJ OHL routes will enable both increased transmission capacity and the amount of renewable generation connected to the GB electricity network, contributing towards a reduced reliance on fossil fuel electricity generation sources.

Deliver the benefits of increased cost-efficiency to network users and consumers by continually innovating and applying whole system solutions.

Integrating load and non-load related drivers in an economic, efficient and co-ordinated manner, the purpose of this project is to facilitate increased power transfer from Scotland to England and enable the timely modernisation of these strategic 400kV OHL routes, as the existing twin ACSR 'Zebra' conductor systems, installed in the early to mid-1960s, are now approaching end of life.

Maintain world-leading resilience and system operability to ensure security of supplies throughout the energy transition.

The works will help maintain system resilience and operability by replacing existing assets that are approaching end of life, while enabling additional transmission capacity as well as the capability to connect new sources of renewable generation, with demand for network capacity expected to increase significantly following the recent ScotWind leasing round announcement.

[17] SP Energy Networks RIIO-T2 Business Plan

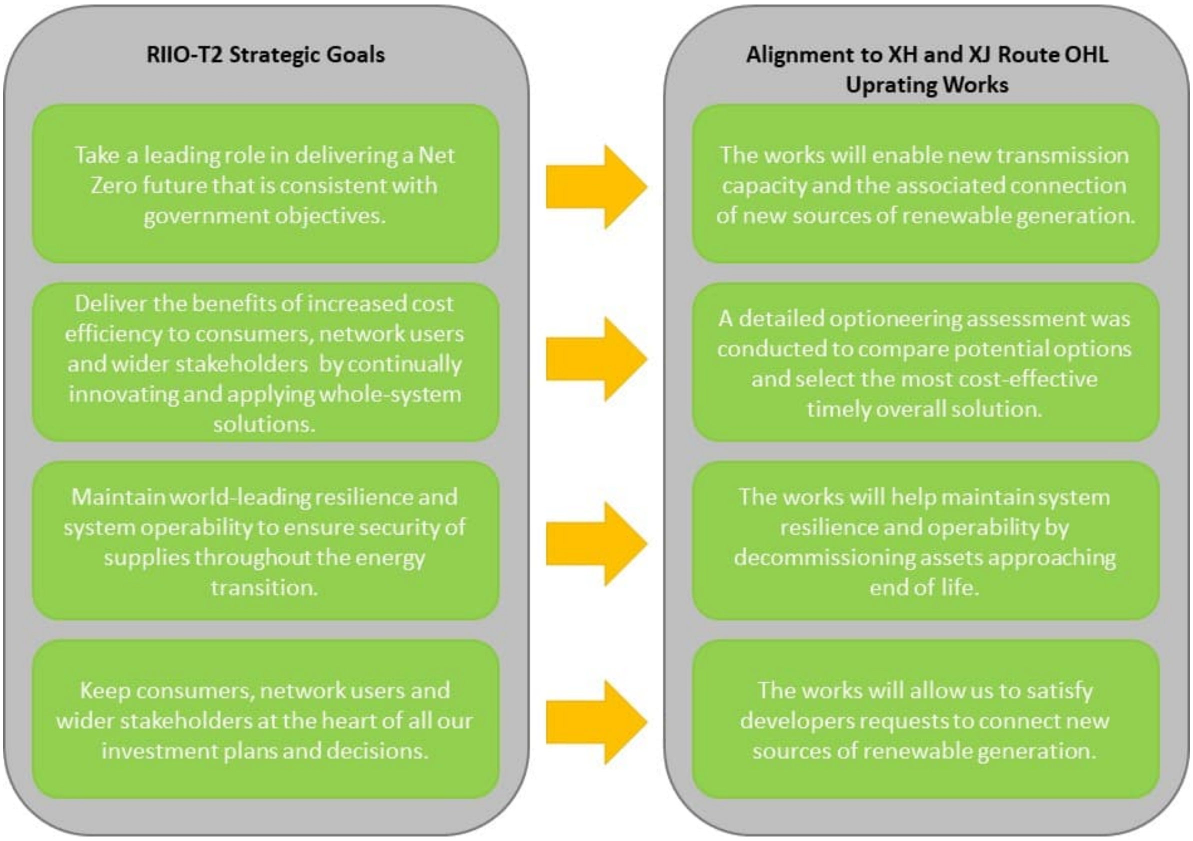

Figure 3: Alignment of the XH and XJ Route OHL Uprating Proposal with SPT RIIO-T2 Strategic Goals

Keep network users and consumers at the heart of all our investment plans and decisions.

The completion of the XH and XJ OHL route uprating and modernisation work is required to maintain and operate an economic, efficient and fit for purpose transmission system, and allow SPT to satisfy network users' requests for connection, consistent with our statutory and licence responsibilities.

Key stakeholders will be consulted during the development of the proposed solution and we will continue to engage with stakeholders throughout the project development and delivery process.

The completion of the XH and XJ OHL route uprating and modernisation works will continue to align with our future strategic ambitions.

5. Assessment of Options

5.1 Existing System Configuration

The existing XH and XJ routes are indicated geographically in Figure 4 below.

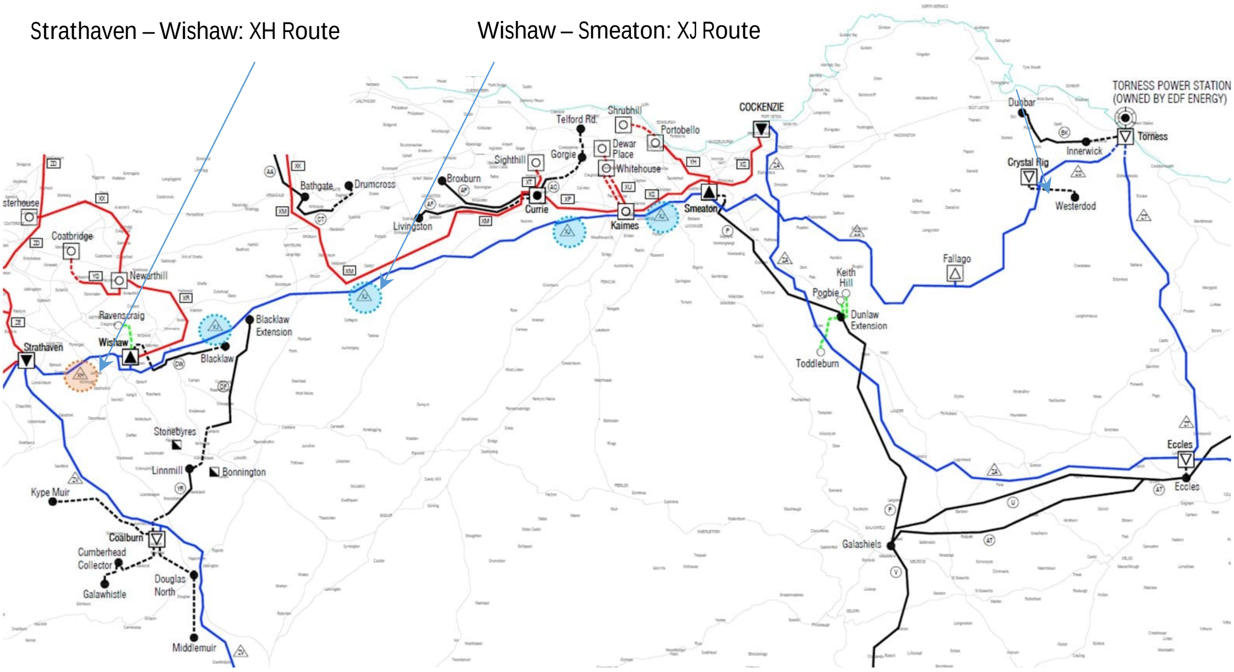

Figure 4 Geographic Indication of XH and XJ OHL Routes[18]

The 400kV circuits supported by XH and XJ routes form part of the Main Interconnected Transmission System (MITS). By virtue of the role of this east - west corridor, following the secured event of a fault outage of either of the two existing 400kV double circuit overhead line routes which connect the Scottish electricity transmission system to England, its thermal capability and performance have a significant impact on the ability to transfer power from Scotland to England.

As detailed Figure 5 and Figure 6, XH and XJ routes support the following circuits:

- Strathaven – Wishaw 400kV (XH northern side)
- Wishaw – Smeaton 400kV (XJ northern side)
- Strathaven – Torness 400kV (XH and XJ southern side)

Outage access to the circuits on the MITS has traditionally been challenging due to [redacted].

[18] XH Route is indicated by the shaded orange circle. XJ Route is indicated by the four shaded blue circles.

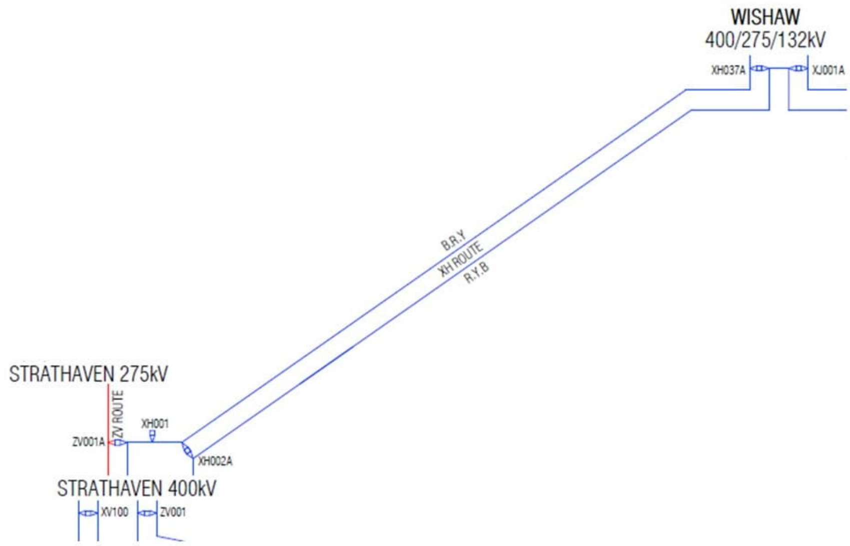

Figure 5 Existing Configuration and Phasing – XH OHL Route

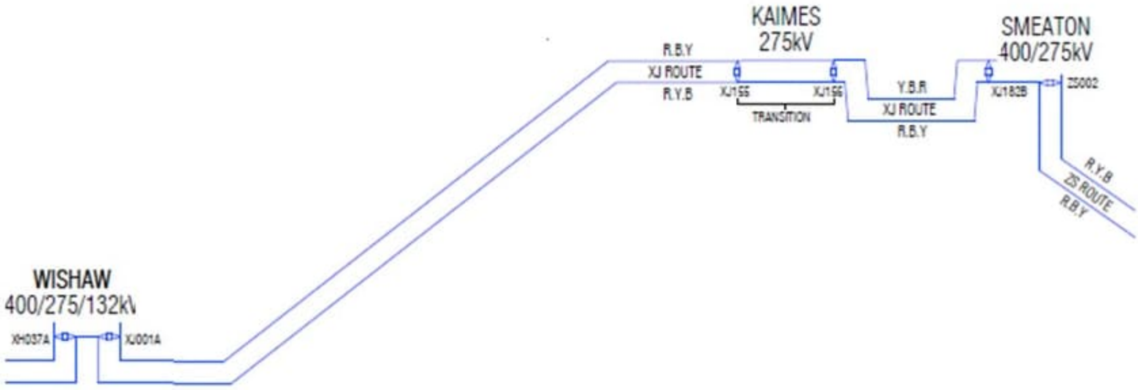

Figure 6 Existing Configuration and Phasing – XJ OHL Route

5.2 Planned System Configuration – HND/ NOA Projects

Following the ESO's publication of the HND and NOA 7 Refresh on 7th July 2022, the following projects were highlighted for progression within SPT's network area.

Table 6 Status within HND – Required for 2030 Targets

NOA7R Code	Description	NOA7 EISD
DNEU	Installation of a new 400/275kV 1000MVA Supergrid transformer (SGT2) at Denny North 400kV substation.	2025
DWUP	Establish a 400kV single circuit corridor south from Kincardine North, on existing overhead line (OHL) routes, to Wishaw substation or Clyde's Mill substation.	2026
E2DC	Establish a High Voltage Direct Current (HVDC) subsea link from a new Branxton 400kV Substation (near Torness) to Hawthorn Pit in the northeast of England. Branxton will facilitate the connection of offshore renewable developments as well as the reinforcement of capacity between Scotland and England.	2027
LWUP	Establish a new 400kV substation north of Kincardine and connect to Denny North at 400kV, integrating load and non-load related investment drivers and enabling significant reinforcement of transfer capacity through central Scotland.	2027
VSRE[19]	*Replace existing OHL conductor on the strategic east-west Strathaven - Smeaton (XH/XJ route) corridor with modern high temperature low sag (HTLS) conductor.*	*2027*
DWNO	Establish a new 400kV OHL from Bonnybridge substation to an existing OHL north of Glenmavis, together with associated substation works, conductor replacement and voltage uprating on existing OHL routes.	2028
EHRE	Replace existing OHL conductor on the southern (Elvanfoot - Harker) section of the strategic north-south Strathaven - Harker (ZV route) corridor with modern high temperature low sag (HTLS) conductor.	2028
BDUP	Uprate the Beauly - Denny OHL route to double circuit 400kV operation.	2029
DLUP	Establish a new 400kV substation at Windyhill and a 400kV single circuit corridor, on existing overhead line routes, between Windyhill, Lambhill and Denny North.	2029
VERE	Replace existing OHL conductor on the northern (Strathaven - Elvanfoot) section of the strategic north-south Strathaven - Harker (ZV route) corridor with high temperature low sag (HTLS) conductor.	2030
TGDC	Creation of a second new High Voltage Direct Current (HVDC) Eastern subsea link from the SPT area, to south of the Humber estuary, in the northeast of England, together with associated onshore works.	2031
TKUP	Establish new 400kV substations at Mossmorran, Westfield and Glenrothes to establish a 400kV double circuit corridor, on existing overhead line routes, between Kincardine North and the SSEN Transmission Tealing substation. Scope includes further works within the SSEN-T area.	2032

Table 7 Status within NOA7 – Proceed

NOA7R Code	Description	NOA7 EISD
CMNC	Creation of a new 400kV double circuit OHL route and associated substation infrastructure from southeast Scotland to the northwest of England.	2033
WCNC	Creation of a new 400kV double circuit OHL route and associated substation infrastructure from southwest Scotland to the northwest of England.	2036
TLNO	Creation of a new 400kV double circuit OHL route and associated substation infrastructure from east central Scotland to the northeast of England.	2037

[19] This project – SPT-RI-130 XH and XJ Route OHL Uprating Works.

5.3 Overview of Options

This section provides a description of the options considered to integrate load and non-load related drivers in an economic, efficient and co-ordinated manner, facilitating increased power transfer from Scotland to England and the timely modernisation of these strategic 400kV OHL routes, and details the key considerations.

Table 8 below presents a summary of the options considered. These build on the options and conclusions detailed in the RIIO-T2 Business Plan Engineering Justification Paper relating to the XH and XJ Routes 400kV Major Refurbishment (ref. SPNLT 20111), the detail of which is not repeated here.

Table 8: Options Summary

	Option	Outcome of Initial Review	Reason for Rejection
1	Do Nothing or Delay	Rejected	A 'Do Nothing' or 'Delay' option is not credible in relation to this project and would be inconsistent with SPT's various statutory duties and licence obligations: *Load Related Considerations* - Timely progression of the replacement of the conductor system on XH and XJ routes is crucial to alleviating constraints on the GB transmission system, enabling growth in renewable electricity and supporting an economic transition to Net Zero emissions. *Non-Load Related Considerations* - This option is unacceptable due to the overall condition of the OHL conductor, which is approaching end of life. The lack of timely intervention will add considerable risk to two of the most critical 400kV double circuit OHL routes within the SPT area. In addition, deferring the investment will lead to accelerating deterioration of the OHL components, in particular the OHL conductor. Should conductor strength be compromised preventing its use as pulling bond, this would significantly increase the cost of conductor stringing activities.
2	Refurbish XH and XJ Routes with Twin 425mm^2 AAAC Totara	Proposed for Further Consideration	-
3	Refurbish XH and XJ Routes with Twin 500mm^2 AAAC Rubus	Proposed for Further Consideration	-
4	Refurbish XH and XJ Routes with a Twin HTLS Conductor	Proposed for Further Consideration	-
5	Replace XH and XJ Routes with new L12 Construction	Proposed for Further Consideration	-
6	Underground XH and XJ Routes	Rejected	This option involves the replacement of XH and XJ OHL routes with 400kV underground cable circuits. This option was considered at a high level, however, a like for like comparison of the cable purchase cost for the circuit length was estimated to be approximately £400m, and potentially £600m best case for delivery (without any variation in length relative to the existing OHL routes, consideration of technical feasibility, engineering difficulties or system operability/ reactive compensation requirements). This option was considered uneconomic and was not progress for further engineering consideration.

Options 2, 3 and 4 provide feasible timely solutions. These options, together with Option 5, are discussed in further detail in the following sections.

Table 9 below provides an overview of the thermal ratings achieved on XH and XJ routes, on a per circuit basis, for each of Options 2, 3 and 4. Table 9 provides detail of the capability of the existing twin ACSR 'Zebra' conductor system for comparison purposes.

Table 9: 400kV Thermal Ratings, per Circuit

400kV Thermal Ratings per Circuit [20]	Twin ACSR 'Zebra' (Existing)[21]		Twin AAAC 'Totara' (Option 2)		Twin AAAC 'Rubus' (Option 3)		Twin HTLS (Option 4)[22]		Twin Araucaria (Option 5)	
Season / State	Amps	MVA	Amps	MVA	Amps	MVA	Amps	MVA	Amps	MVA
Winter Pre-Fault	1680	1170	2430	1680	2710	1880	3370	2340	3400	2360
Winter Post-Fault	2010	1390	2890	2000	3230	2240	4010	2780	4050	2810
Spring/Aut. Pre-Fault	1560	1080	2330	1610	2610	1810	3320	2300	3270	2260
Spring/Aut. Post-Fault	1850	1280	2770	1920	3100	2150	3950	2740	3890	2700
Summer Pre-Fault	1340	930	2170	1500	2430	1680	3230	2240	3040	2110
Summer Post-Fault	1600	1110	2580	1790	2890	2000	3850	2670	3620	2510

Table 10 below provides an indication of the incremental thermal ratings achieved on XH and XJ routes, on a per circuit basis, for each of Options 3, 4 and 5 relative to Option 2 (which represents the like for like replacement of the existing twin Zebra with a modern equivalent conductor system).

Table 10: Incremental 400kV Thermal Ratings, per Circuit, Relative to Option 2

Incremental 400kV Thermal Ratings per Circuit relative to Option 2	Twin AAAC 'Totara' (Option 2)		Twin AAAC 'Rubus' (Option 3)		Twin HTLS (Option 4)		Twin Araucaria (Option 5)	
Season / State	Amps	MVA	Amps	MVA	Amps	MVA	Amps	MVA
Winter Pre-Fault	-	-	280	200	940	660	970	680
Winter Post-Fault	-	-	340	240	1120	780	1160	810
Spring/Aut. Pre-Fault	-	-	280	200	990	690	940	650
Spring/Aut. Post-Fault	-	-	330	230	1180	820	1120	780
Summer Pre-Fault	-	-	260	180	1060	740	870	610
Summer Post-Fault	-	-	310	210	1270	880	1040	720

5.3.1 Option 2 - Refurbish XH and XJ Routes with Twin 425mm^2 AAAC Totara

The scope of work associated with this option is aligned with the accepted scope of the RIIO-T2 Engineering Justification Paper for scheme SPNLT20111. This option involves the major refurbishment of the routes with a twin 425mm^2 AAAC (Totara) conductor system due to the condition of the existing conductor. While the major refurbishment of the routes with 425mm^2 AAAC (Totara) conductor system removes the risks associated with the condition of the existing ACSR conductor, it no longer meets the transmission requirements identified via the NOA and the OTNR HND (reference Section 4.3).

[20] 90°C Maximum Operating Temperature for AAAC Options 2, 3 and 5 (Resistivity 30.5 nΩ.m).

[21] 50°C Maximum Operating Temperature for existing ACSR 'Zebra'.

[22] Based on 190°C Maximum Operating Temperature, ACCR Drake. Note however that Option 4 would involve specification of a conductor with thermal rating not less than ACCR Drake.

5.3.2 Option 3 - Refurbish XH and XJ Routes with Twin 500mm^2 AAAC Rubus

The scope of work associated with this option is aligned with the accepted scope of the RIIO-T2 Engineering Justification Paper for scheme SPNLT20111, except for this option involving the major refurbishment of the routes with a twin 500mm^2 AAAC (Rubus) conductor system. While the major refurbishment of the routes with 500mm^2 AAAC (Rubus) conductor system removes the risks associated with the condition of the existing ACSR conductor, it does not meet the transmission requirements identified via the NOA and the OTNR HND (reference Section 4.3).

This option involves additional steelwork and foundation reinforcement works to accommodate the larger conductor system on towers of L2 design and therefore leads to increased capital cost for a relatively modest incremental thermal capacity of up to 240MVA per circuit (ref. Table 10).

5.3.3 Option 4 - Refurbish XH and XJ Routes with a Twin HTLS Conductor System

The scope of work associated with this option is aligned with the accepted scope of the RIIO-T2 Engineering Justification Paper for scheme SPNLT20111, with the exception of this option involving the major refurbishment of the routes with a twin HTLS conductor system and including the northern circuit on XH route. The current carrying capability of the HTLS conductor system will be specified to be not less than that in Table 9 above.

The major refurbishment of the routes with a HTLS conductor system removes the risks associated with the condition of the existing ACSR conductor and meets the transmission system requirements identified via the NOA and the OTNR HND (reference Section 4.3), delivering a significant incremental thermal capacity of not less than 880MVA per circuit (ref. Table 10). When complete, it will provide the full functionality required to give XH and XJ routes a further 40 years of service without further major intervention.

5.3.4 Option 5 - Replace XH and XJ Routes with a new Route of L12 Construction

The scope of work associated with this option involves the complete replacement of the existing XH and XJ routes with two new routes of L12 type construction, capable of supporting a twin 700mm^2 AAAC (Araucaria) conductor system. It is assumed that the new routes would be established alongside the existing XH and XJ OHLs and the existing routes removed upon completion.

This option would involve a significantly higher capital cost relative to Options 2, 3 and 4, albeit with reduced system access requirements for construction outages. It is not considered to be efficient given the remaining life of the existing XH and XJ route towers. While it would deliver an incremental thermal capacity of up to 810MVA per circuit (ref. Table 10), marginally lower than that delivered by Option 4 above, due to the lead time to deliver such a project, inclusive of the requirement to secure new Section 37 consent and land agreements, this option cannot remove, in a timely manner, the risks associated with the condition of the existing ACSR conductor.

5.4 Option Assessment

As described in our RIIO-T2 Business Plan Annex 8[23], while most engineering justification papers have a CBA aligned with the RIIO-T2 CBA model, projects in the following categories do not:

- Live projects rolling over from RIIO-T1, since they have already initiated, with decisions made during the previous price control.
- Customer connection projects, as the proposed approach is based on agreement with the connecting party as they will bear a sizeable proportion of the costs incurred.

[23] Annex 8 - Cost Benefit Analysis Methodology (spenergynetworks.co.uk)

- TO Reinforcements associated with new connections, where the options considered are evaluated purely based on the lowest cost solution, which meets the project objectives, as the benefits are all comparable.
- Projects justified through the Network Options Assessment Process as these are subject to an extensive and rigorous CBA process by the Electricity System Operator who can consider market options, and different options which may be offered by Transmission Owners.

Projects in the four categories above have an associated document (this MSIP Re-Opener application in respect of the XH and XJ route OHL uprating) explaining the feasible options and the reasoning behind the selection of the preferred investment option.

The short-listed options relating to the economic, efficient and co-ordinated development of the transmission system to facilitate increased power transfer from Scotland to England and enable the timely modernisation of these strategic 400kV OHL routes are described in Section 5.3 while Table 11 summarises the key benefits and disadvantage of each option.

In general terms, to achieve an increased thermal capacity, exceeding the value of an existing conductor, replacement with a larger conductor is required. The largest conventional (AAAC) conductor suitable for the L2 tower design on XH and XJ routes does not however meet the projected load growth for these circuits (Option 3). Traditionally, this would result with the circuits having to be rebuilt with the larger conductor system (Option 5). The use of HTLS conductor systems however, enables the reuse of the existing OHL towers and removes the need to build approximately 74km of new overhead line (Option 4).

Option 4 is the preferred investment option to integrate load and non-load related drivers in an economic, efficient and co-ordinated manner. It delivers similar incremental capacity to Option 5, but at significantly lower capital cost, facilitating increased power transfer from Scotland to England while enabling the timely modernisation of the strategic XH and XJ 400kV OHL routes.

There is no market based alternative to the preferred investment option.

Table 11: Option Benefits, Drawbacks and Selection Outcome

	Option	Estimated Capital Cost (2018/19)	Key Advantages	Key Disadvantages	Option Outcome
2	Refurbish XH and XJ Routes with Twin 425mm^2 AAAC Totara	£39.1m	- Lowest overall capital cost.	- Inconsistent with the transmission requirements identified via NOA and the OTNR HND. - High risk of further intervention being required on these strategic routes and assets within the operational lifetime of the replacement conductor system.	Rejected
3	Refurbish XH and XJ Routes with Twin 500mm^2 AAAC Rubus	£67.29m	- Lower overall capital cost relative to Options 4 and 5.	- Inconsistent with the transmission requirements identified via NOA and the OTNR HND. - High risk of further intervention being required on these strategic routes and assets within the operational lifetime of the replacement conductor system.	Rejected
4	Refurbish XH and XJ Routes with a Twin HTLS Conductor System	£85.769m	- Consistent with the transmission requirements identified via NOA and the OTNR HND, delivers a significant incremental thermal capacity not less than 880MVA/ circuit. - Provides full functionality required to give XH and XJ routes a further 40 years of service without further major intervention.	- Higher overall capital cost relative to Options 4 and 5 reflective of conductor system technology and installation methods.	Proposed
5	Replace XH and XJ Routes with a new Route of L12 Construction	£144.45m	- Anticipated reduction in system access requirements for construction outages.	- Highest overall capital cost. - Inefficient given the remaining life of the existing towers. - Due to project lead time, inclusive of the requirement to secure new Section 37 consent and land agreements, this option cannot remove the risk associated with the condition of the existing ACSR conductor in a timely manner. - Reduced incremental thermal capacity per circuit in Spring, Autumn and Summer rating seasons relative to Option 4.	Rejected

6. Proposed Works

6.1 Summary

HTLS conductors can deliver significant increases in current carrying capacity by overcoming the characteristic constraints of standard conductors when operating at higher temperatures. The use of substitute cores, made with carbon or composite materials, are not only light but capable of handling both the weight and tension, notably sagging significantly less than standard conductors at operating temperatures between 150°C to 210°C.

A common characteristic of carbon and composite cored conductors is their susceptibility to core failure if the manufacturer's recommended guidance is not followed and the bending radius is exceeded. Installation is the greatest risk of the process to establish an effective HTLS system. This project is therefore being developed informed by SPTs recent experience of installation and operation of the ACCR 'Drake' HTLS conductor system on the Kilmarnock South – Coylton (XY) OHL route.

The proposed solution for XH and XJ OHL routes is the replacement of the 400mm^2 'Zebra' ACSR and 425mm^2 'Totara' AAAC (1 x circuit of XH route only) with a HTLS conductor system (ACCR Drake or similar). The current carrying capability of the HTLS conductor system will be specified to be not less than that summarised in Table 9 above. The proposed HTLS conductor system shall be capable of achieving or improving upon the thermal ratings above, which as a minimum align the winter post-fault continuous rating of the replacement conductor system with the 4000A continuous rating of the existing 400kV switchgear and primary equipment at Strathaven, Wishaw and Smeaton 400kV Substations.

On XH route, it is proposed to replace the 175mm^2 'Lynx' ACSR earthwire with a 36 fibre, 160mm^2 'Keziah' equivalent AACSR with an optical fibre incorporated in the earth wire (OPGW). This will provide an improvement in fibre connection in this section of the Network and allow transfer of communication and protection information.

Tower foundations on both routes will be assessed to identify any structural overloads and address any repair/replacement or upgrade as required.

This proposed scope of works is aligned with the accepted scope of the RIIO-T2 Engineering Justification Paper for scheme SPNLT20111, apart from the now proposed application of an HTLS conductor system delivering significantly higher current carrying capability and the inclusion of the northern side of XH route.

6.1.1 Proposed Works on XH Route

The proposed works are summarised as follows:

- Re-conductor both 400kV circuits with a twin HTLS conductor system.
- Replace earthwire with a single "Keziah" 160mm^2 AACSR equivalent OPGW.
- Replace all tension and suspension conductor end fittings.
- Replace earthwire fittings.
- Replace tower muff foundations as required per condition.
- Upgrade foundations as required per condition.
- Replace downleads and fittings at Strathaven and Wishaw substations.
- Steelwork modifications as per TGN161 and TGN163.

- Replace heavily corroded or damaged steelwork (above category 4).
- Update all OHL records to reflect the works carried out.

6.1.2 Proposed Works on XJ Route

The proposed works are summarised as follows:

- Re-conductor both 400kV circuits with a twin HTLS conductor system.
- Replace all tension and suspension conductor end fittings.
- Re-sag the earthwire as required to match the HTLS conductor, ensuring the shade angle provides sufficient coverage from lightning strikes.
- Replace tower muff foundations as required per condition.
- Upgrade foundations as required per condition.
- Replace downleads and fittings at Wishaw, Kaimes and Smeaton substations.
- Steelwork modifications as per TGN161 and TGN163.
- Replace heavily corroded or damaged steelwork (above category 4).
- Update all OHL records to reflect the works carried out.

6.2 Environmental and Consent Related Works

The existing XH and XJ routes have Section 37 consent to operate at 400kV and no new Section 37 consent will be required. Landowner agreements will be required to deliver these works however. 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.

6.3 Stakeholder Engagement

SPT's Stakeholder Engagement Plan for the XH and XJ route works will be closely aligned to our wider Stakeholder Engagement commitments as outlined in our RIIO-T2 business plan. It will centre around timely engagement with key stakeholders to achieve mutually acceptable outcomes. We recognise that stakeholders' influence and interest in the project will vary as the project develops and that stakeholders' opinions may change over time. As well as affected landowners, SPT will engage with:

- NGESO in relation to system access for construction outages - Detailed outage requirements and sequences will be developed as part of the detailed project design. Delivery of the construction works will be carefully co-ordinated and integrated with the system access requirements of the projects identified in Table 6. Detailed consideration will be given to the stage by stage sequencing of works e.g., completion of works on a circuit by circuit basis, such that the operational impact of later outages in sequence is mitigated by increased circuit thermal rating(s) delivered during outages earlier in the sequence. This may have a bearing on project delivery methods, programme and capital cost.
- EDF in relation to the impact on Torness Generating Station, in accordance with the Scottish Nuclear Site Licence Provisions Agreement (SNSLPA).

7. Project Cost Estimate

As agreed with Ofgem, a further (Stage 2) MSIP submission will be made at the right time relating to the associated amendments to the outputs, delivery date and allowances to be detailed in LSpC 3.14 Appendix 1. The detail in this section is therefore indicative pending that further submission.

7.1 Estimate Total Project Costs

Aligned with the format of the Re-Opener Pipeline Log, Table 12 details the expected energisation year and the current view of potential direct capital expenditure. The (RIIO-T2) allowances will be subject to the Opex escalator mechanism:

Table 12: Estimated Incidence of Expenditure

	Potential direct capex value per year, £m, 18/19 price base								
Energisation Year	Yr 21/22: direct capex	Yr 22/23: direct capex	Yr 23/24: direct capex	Yr 24/25: direct capex	Yr 25/26: direct capex	Yr 26/27 (T3): direct capex	Yr 27/28 (T3): direct capex	RIIO-T2 Total: direct capex	Total: direct capex
2027/28	-	0.205	5.376	21.559	27.638	23.494	7.497	54.778	85.769

Current estimates for the capital cost of this project have been developed using experience of the successful Innovation Roll-out Mechanism project to install HTLS conductor systems in South West Scotland.

7.2 Regulatory Outputs

The indicative primary asset outputs are identified in Table 13 below:

Table 13: Regulatory Outputs Table (Volumes)

Asset Category	Asset Sub-Category Primary	Voltage	Forecast Additions /Activity	Forecast Disposals
Overhead Tower Line	OHL (Tower Line) HTLS Conductor	400 kV	147.32 km	147.32 km
Overhead Line Fittings*	Fittings	400 kV	444 each	444 each
Earth Wire	OHL (Tower Line) Earth Wire	400 kV	11.6 km	11.6 km
Earth Wire Fittings	Earth Wire fittings	400 kV	39 per set	39 per set
Overhead Tower Line	Tower	400 kV	222 each	

**Overhead Line Fittings outputs refers to spacers and vibration dampers and not to the replacement of the whole insulator set.*

8. Delivery

We have applied our 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.

8.1 Delivery Schedule

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 14 summarises the key milestones within the delivery schedule.

Table 14: Key Milestone

Milestone	Phase	Estimated Completion Date
1	Issue ITT	March 2023
2	Award Main OHL Works Contract	October 2023
3	Commence Site Works	December 2024
4	Complete Site Works	October 2027

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.

8.2 Risk and Mitigation

A Risk Register has been generated collaboratively during the initial design stages to identify any risks, which if realised, could result in deviation from the delivery plan. Mitigation strategies have also been 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:

[redacted]

8.3 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:

8.3.1 Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product are detailed in the Project Risk Register (that is noted in Section 6.5 above).

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

8.3.2 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.

8.3.3 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.

8.3.4 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.

9. Conclusion and Recommendations

This MSIP Re-opener application demonstrates the need to facilitate increased power transfer from Scotland to England and enable the timely and coordinated modernisation of the strategic XH and XJ 400kV OHL routes. These works are programmed to commence in the RIIO-T2 period and complete in 2027/28, during the RIIO-T3 period.

To ensure the electricity transmission system enables a timely transition to Net Zero, in line with UK and Scottish Government targets of 2050 and 2045 respectively, asset intervention must be considered in the context of both current and future system requirements. It is vital that the risk of repeated intervention on strategic routes and assets (and therefore repeated system access for construction purposes) is minimised, where the need for such intervention within the operational lifetime of the replacement asset may reasonably be foreseen.

The main conclusions of this submission are:

- The timely connection of low carbon generation, including onshore and offshore wind, will play a vital role in reaching legislated net zero targets, and is aligned with SPT's RIIO-T2 strategic goals.
- It is necessary to make significant investment in the capability of the existing transmission system through Scotland and the north of England to accommodate growth in renewable generation. This is required to maintain and operate an economic and efficient transmission system. It is critical to allow the network to keep pace with projected growth to support legislated Net Zero targets whilst also enabling significant constraint savings.
- An MSIP Re-opener application is required in respect of these works.

We, respectfully, request Ofgem's agreement to the following:

- The option being progressed addresses a clear customer need and represents value to UK consumers, therefore, the works should proceed based on the preferred solution (Option 4).
- Efficient expenditure is fully funded, as necessary to maintain programme timelines and mitigate project delivery risk e.g., order long-lead equipment, prior to the second stage MSIP submission and assessment.

Appendix A - SP Transmission System, Geographic Overview