Gala North 400/132kV Substation

Major Projects EJP
Version: 1.0
11/12/2024

SP Energy Networks
RIIO-T3 Business Plan

SP Energy Networks

Gala North 400/132 kV Substation			
Name of Scheme	Gala North 400/132 kV Substation		
Investment Driver	Local Enabling (Entry)		
BPDT / Scheme Reference Number	SPT200642 / SPT200495		
Outputs	Platform creation 1 unit Circuit breakers 400kV 6 units Circuit breaker 132kV 8 units Disconnectors 400kV 14 units Disconnectors 132kV 20 units Transformers 400/132kV (360MVA) 2 units		
Cost	£158.45m		
Delivery Year	2029		
Applicable Reporting Tables	BPDT (Section 5.1 Project_Meta_Data, Section 6.2 Scheme_C&V_Calc_NonLoad_Actuals and Section 11.10 Contractor Indirects)		
Historic Funding Interactions	N/A		
Interactive Projects	N/A		
Spend Apportionment	**ET2**	**ET3**	**ET4**
	£2.68m	£155.77m	£0m

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1. Introduction

This engineering justification paper establishes SP Transmission's plans to establish a new 400/132 kV substation, Gala North, to uprate and reinforce transmission capabilities in line with the CMN3 and HGNC tCSNP2 schemes and to enable a number of connections around the Scottish borders area.

This EJP is submitted for Ofgem's assessment of the need case for the project in order to provide sufficient funding for the pre-construction activities. A full cost submission will be made at the appropriate time, once the project is sufficiently developed to do so.

2. Background and Purpose

SP Transmission plc (SPT), as a transmission licence holder, has the responsibility "to develop and maintain an efficient, co-ordinated and economical system of electricity transmission" (Electricity Act 1989).

In the context of both UK and Scottish Government net zero targets, now supported fully by National Planning Framework for Scotland 4 (NPF4), development of our transmission infrastructure is key to meeting these targets, with SPEN required to deliver significant system reinforcement as well as facilitating the connection of increased renewable energy generation.

The purpose of this document is to set out the broader policy context and needs case for a new 400/132kV substation at the proposed Gala North substation site.

2.1. Statutory Obligations

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.

2.2. Broader Policy Context

Government Policy

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[1] 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.

In December 2022 the Scottish Government published its Onshore Wind Policy Statement[2], setting out its ambition deploy 20GW of onshore wind capacity by 2030. This is in addition to the Scottish Government's ambition of 11GW of offshore wind by 2030.

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 throughout 2022 culminating in approximately 28GW of offshore wind being offered option agreements reserving the rights to specific areas of seabed.

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[3] (OTNR) Generation Map[4].

ScotWind offshore developments are expected to 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 legislated Net Zero targets.

2.3. 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

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[1] British energy security strategy - GOV.UK (www.gov.uk)
[2] Onshore wind: policy statement 2022 - gov.scot (www.gov.scot)
[3] Offshore Transmission Network Review
[4] 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 of 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) (see Figure 1).

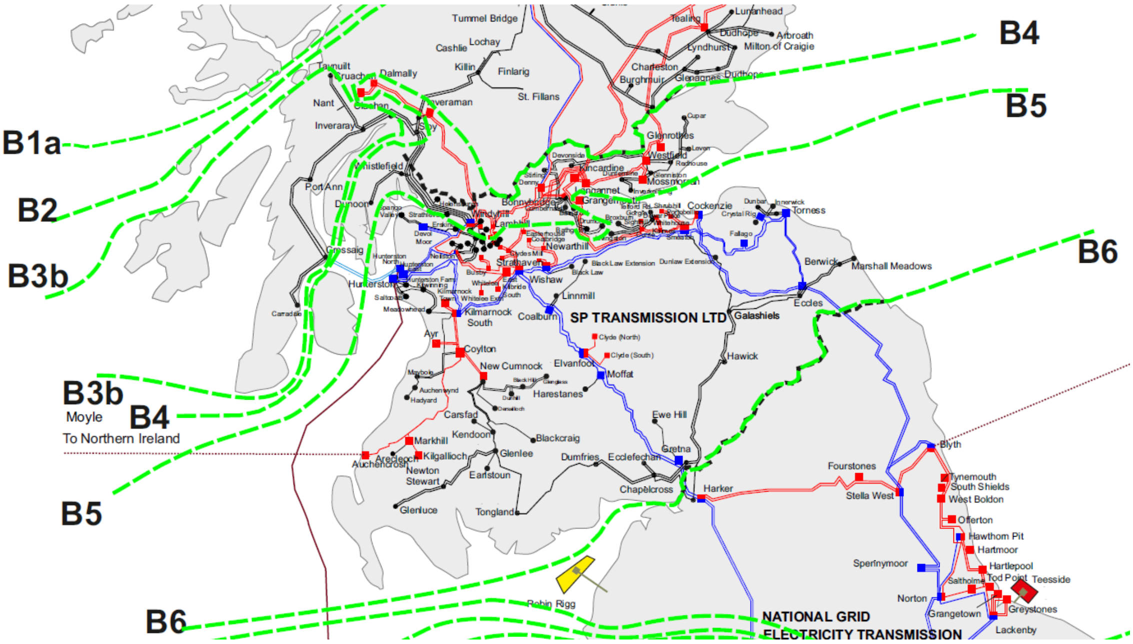


Figure 1: Network boundaries across SPT's network

The figure below indicates the 2023 FES and 2024 FES required transfer capability on the B6 boundary. The existing capability of B6 is already exceeded predominantly due to the connection of onshore and offshore wind across central and northern Scotland.

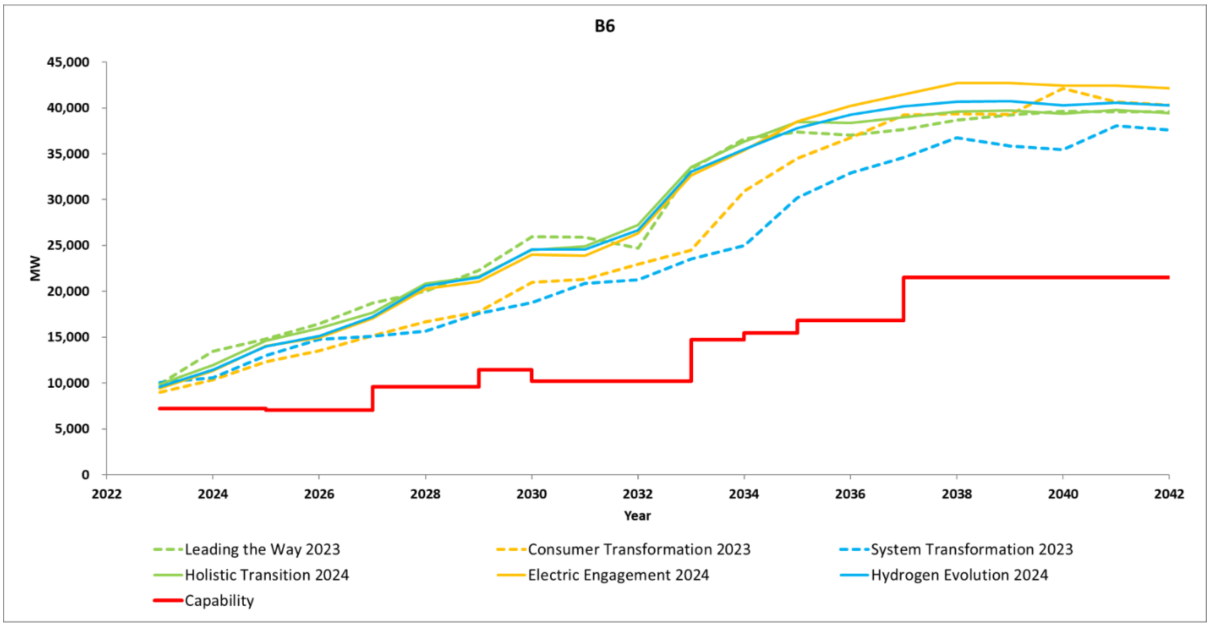


Figure 2: Required transfers and base capability for B6 boundary

The current capability of transmission network boundary B6 is approximately 6,700MW, dependent upon the geographic disposition of renewable generation output and based on a thermal limitation on the cross border ZV route, south of Elvanfoot. Figure 2 above shows a required transfer of up to 24.9GW by 2030 and up to approximately 38.5GW by 2035. 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.

2.4. Beyond 2030 Publication

Building upon NGESO's Network Options Assessment (NOA) 2021/22 Refresh report[5] the recent publication of NGESO's "Beyond 2030" report[6] outlines a requirement for further significant network reinforcements to the value of approximately £58 billion across Britain.

The report's recommendations will facilitate the connection of an additional 21GW of low carbon generation to the GB transmission system as a direct result of the ScotWind leasing round and will help the UK meet its decarbonisation ambitions.

The Beyond 2030 report details the output of a holistic network design exercise undertaken by the NGESO and TOs which assessed various permutations of onshore and offshore network reinforcement against an agreed set of design criteria[7]. One of the key areas identified for onshore reinforcement within the report is central and southern Scotland where a coordinated suite of onshore reinforcements has been identified to complement the proposed offshore network and provide a significant increase to the transfer capability of key system boundaries including B6.

2.5. The CMN3 Project

As part of the annual Network Options Assessment (NOA) a new 400 kV double circuit OHL was identified as a means of creating a third onshore 400 kV double circuit over the B6 boundary. This was originally identified within NOA7 as "CMNC – South East Scotland to North West England" and was given a Proceed recommendation. The need for the reinforcement project has recently been reaffirmed through the Transitional Centralised Network Plan 2 (tCSNP2) under the reference "CMN3". Generation connection applications have also been received along this corridor which similarly contribute to the need to establish the Gala North substation.

CMN3 provides an increase to the B6 transfer capability by establishing a new 400 kV double circuit OHL from the new Gala North 400/132 kV substation to the Carlisle area within NGET's licensed area via new 400 kV 'collector' substations at Ettrickbridge and Teviot.

The majority of the CMN3 scheme when it is considered as its constituent parts is required to enable new onshore connections with ~812 MW of contracted offers in Borders the Scottish via the proposed new Gala North 400/132 kV substations.

[5] Subject reinforcement recommended to Proceed within NOA 2021/22 Refresh see option ref CMNC within download (nationalgrideso.com)
[6] nationalgrideso.com/document/304756/download
[7] Further detailed provided within NGESO's Beyond 2030 Technical Report Final Strategic Options Appraisal (nationalgrideso.com)

[redacted]

Figure 3: Planned CMN3 Scheme, shown in Pink (Indicative only, subject to further routing activities)

2.6. The HGNC Project

Within the tCSNP2, HGNC project was recommended to Proceed, which would construct a new 400kV double circuit between the proposed Harburn 400kV substation and Gala North 400kV substation. This facilitates an increase in B6 boundary capability by strengthening network connectivity between the existing "cross-country" Strathaven – Torness/Branxton circuit and the primary east coast B6 crossing circuits Eccles – Stella and CMN3. With the increase in power flow across the SPT system, there will be a need for additional voltage support, in the form of reactive compensation. Analysis on what these requirements are is ongoing in line with the broader development of the HGNC project, however it is anticipated that there will be a need for installation of MSCDNs and/or other forms of reactive compensation at Gala North 400kV substation. Due to the stage of development, and requirement later than the initial construction, these are not included in the scope of this paper, however development of the site layout will be cognisant of this requirement.

2.7. Existing System

The existing electrical infrastructure in the borders region of Scotland around where the Gala North 400 kV substation is due to be connected is shown in Figure 4 (geographic) and Figure 5 (Network Diagram). As can be seen, the borders region consists of an existing 132 kV double circuit connecting Gretna to Hawick, a 132 kV single circuit connecting Hawick to Galashiels (supported primarily on double circuit overhead line towers), and a 132 kV double circuit connecting to Eccles from Galashiels.

As shown in Figure 4 (geographic) and Figure 5 (Network Diagram) there currently is no 400 kV or 275 kV infrastructure in the surrounding region. The addition of the 400 kV substation with four 400/132 kV SGTs will provide capacity for contracted and future connections.

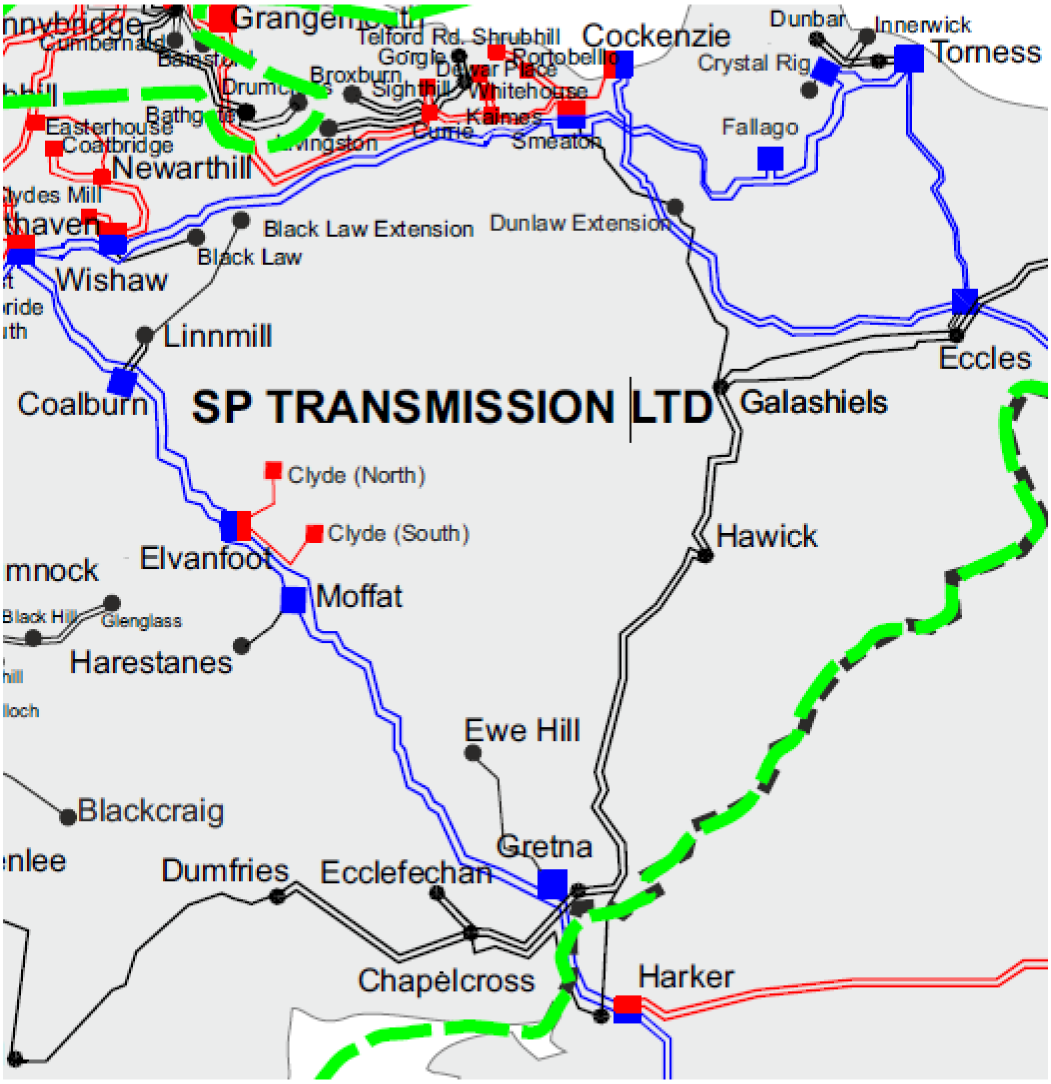


Figure 4: Existing Geographical Transmission Network in Area - Extracted from ETYS Appendix A)

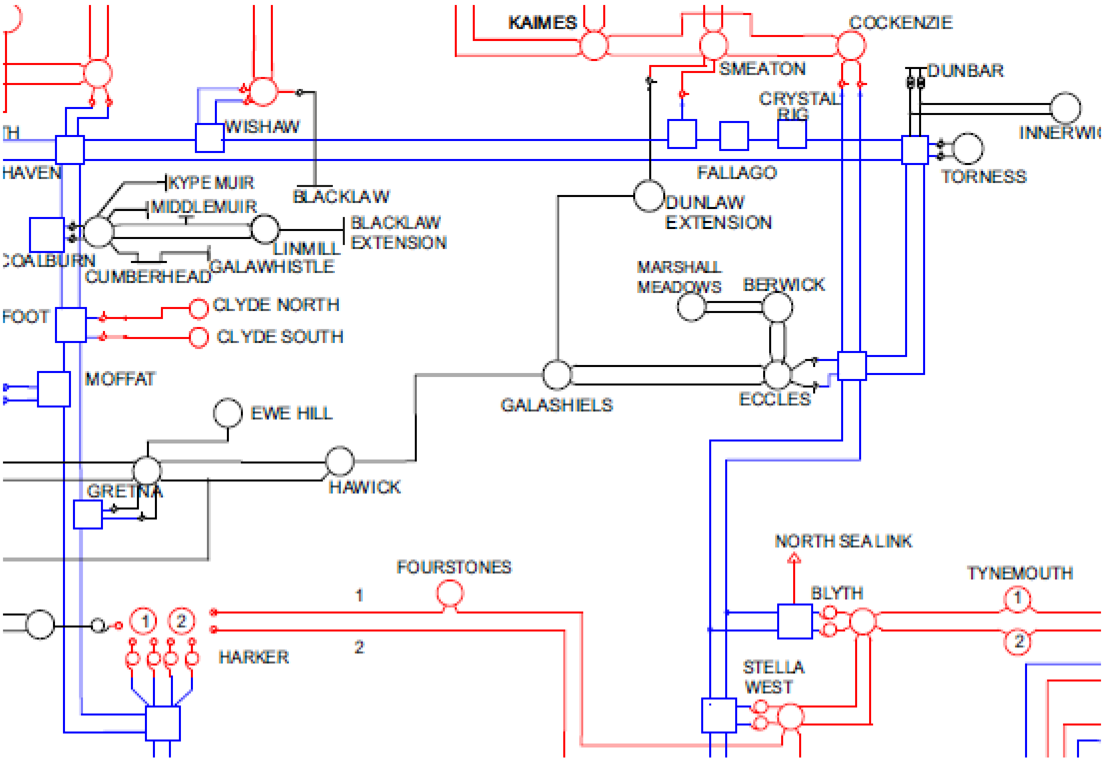


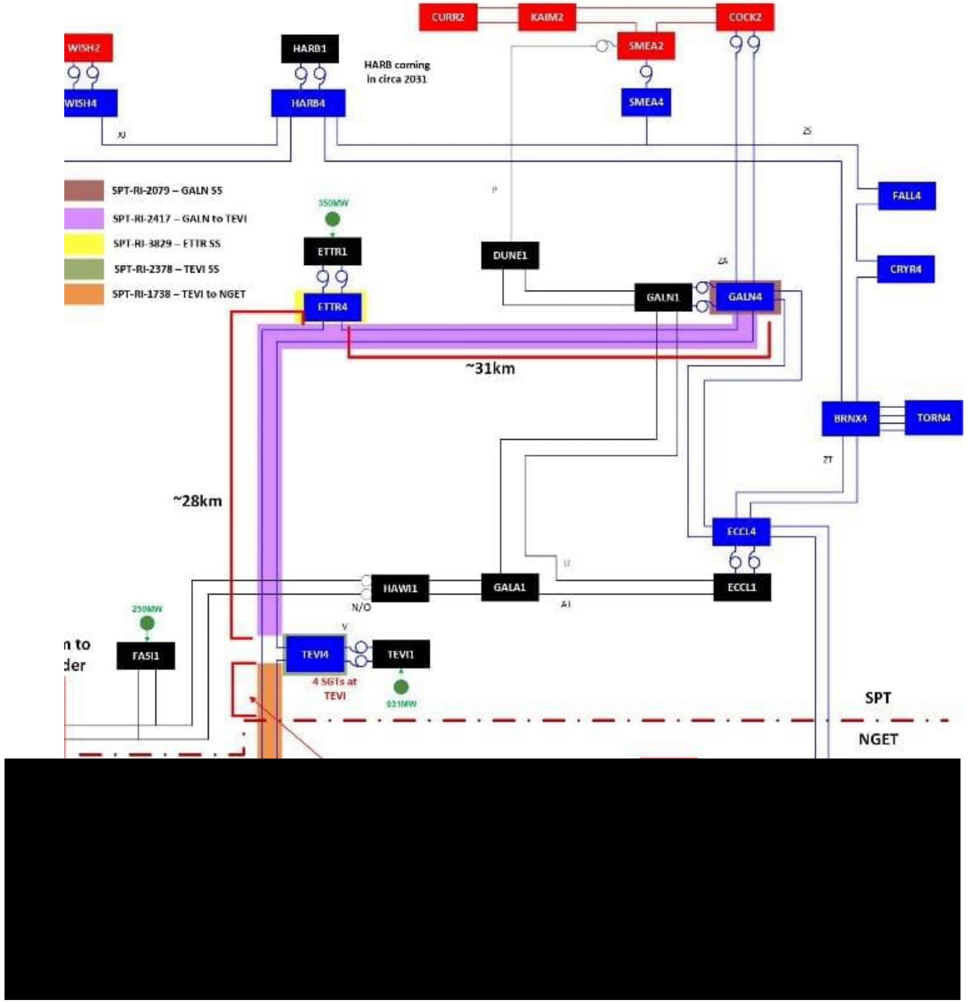
Figure 5: Existing SLD Transmission Network in Area - Extracted from Networks Diagram Geographical Layout shown in ETYS Appendix A (Figure A-1)

2.8. Wider System Upgrades

In order to facilitate new connections and uprate the transmission networks 400 kV capacity within the Borders region, several transmission works have been proposed of which SPT-RI-2079 and SPT-RI-2080 are part. These works are listed below and are shown graphically in Figure 6 below:

- **SPT-RI-2079 –** Gala North 400 kV Substation
- **SPT-RI-2080 –** Gala North 132 kV Substation
- **SPT-RI-2417 –** Gala North to Teviot 400 kV OHL
- **SPT-RI-3829 –** Ettrickbridge 400/132 kV Substation
- **SPT-RI-2378 –** Teviot 400 kV Substation & 132 kV “A” Board
- **SPT-RI-2418 –** Teviot 132 kV “B” Board
- **SPT-RI-1738 –** Teviot to NGET

The construction of the Gala North 400kV and 132kV substations in the Borders region is part of a co-ordinated package of works which include SPT-RI-2079 and SPT-RI-2080. The Gala North works are an integral element of the proposed reinforcement of the B6 boundary, providing connections to contracted developments in an area without transmission infrastructure. It is noted that the scope of this EJP is for the proposed Gala North 400/132 kV substation, and it does not include the OHL replacement and modification works required on the ZA and P routes in the vicinity of the Gala North substation.



[redacted]

Figure 6: Proposed CMN3 Upgrades in Borders Scotland Area - Extracted from CMN3 SLD

2.9. New Connections

There is currently circa 2069 MW of contracted generation to be added to the network in this region which will not be possible without a co-ordinated package of network upgrades which includes the development of a new 400/132 kV substation around the Gala North area to connect with the wider network. The details of the contacted generation projects currently determined to be dependent on the aforementioned works are listed in Table 1.

Table 1: Contracted Generation Dependent Upon SPT-RI-2079 (Development of Gala North 400 kV Substation)

Connecting Substation	Contracted Development	Consent Status	Contract Status	TECA Score[8]	Contracted Energisation Date	SPT-RI-2079	Associated Enabling Works
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capacity (MW)		-		-	-	**811.9 MW**	-

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 generation 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

[8] Transmission Economic Connections Assessment (TECA) – This assessment represents SPT's best view of the contracted generation background to 2036 and to evaluate timely delivery of reinforcement works. This regular assessment activity provides updated projections of renewable development in Scotland, and feeds into SPT's plans, ensuring the investment best meets the needs of users and customers.

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 there is sufficient confidence that a number of the projects for which SPT-RI-2079 is enabling works will connect to the network, based on those categorised as high and medium probability to progress these 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. Optioneering

This section provides a description of the options that were considered to accommodate connection of renewable generation developments in the Scottish Borders area as well as reinforce the B6 connection boundary for future transmission requirements. A summary of each option is described in Table 4. Also, the system requirements and design parameters for the considered options are summarised in Table 5.

Our optioneering approach has identified Whole System interactions with other electricity network / system operators in the development of our proposed solution and has considered the appropriate Whole System outcome. The scope of the options appraisal is limited to the substation only and has been based on the current proposed voltage levels in the CMN3 scheme consisting of a 400 kV connection between the Carlisle area and the proposed Gala North 400 kV substation, as set out in NOA7 as “CMNC – South East Scotland to North West England”.

The options summary section has been split into two comparative sections for discussion of the substation technology type for both the proposed 400 kV interconnection with the CMN3 scheme, and to accommodate the proposed 132 kV rebuild of the Dunlaw Extension substation connecting to the 132 kV side of the Gala North 400/132 kV substation which is not included in the scope of this EJP. Each section discusses the relative merits of Air Insulated Switchgear (AIS) and Gas Insulated Switchgear (GIS). Option 1A and Option 1B compare the technology options for the 400 kV side of the proposed 400/132 kV Gala North substation, whereas Option 2A and 2B compares the technology options for the 132 kV side of the proposed 400/132 kV proposed substation. Figure 7 Figure 7 below details the overall single line diagram for the proposed Gala North 400/132 kV substation.

3.1. Baseline: Do Nothing / Deferral

A 'Do Nothing' or 'Delay' option is 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 NGESO. The proposed works are identified as Enabling Works in the connection agreements relating to the projects in Table 1.

3.2. Preferred Option Gala North 400/132 kV Substation

This section discusses the relative merits in technology type selection for the 400 kV side of the proposed Gala North 400/132 kV Substation in terms of comparison between AIS and GIS options. Each option shall consist of a double busbar 'Gala North' 400 kV substation and shall facilitate the connection of 811.9 MW of generation as part of the CMN3 reinforcement scheme. This option requires the following works to facilitate the addition of a 20-bay 400 kV double busbar substation:

The 400 kV scope of SPT-RI-2079 is noted below, and shown graphically in Figure 7 in yellow:

- 2 x 400 kV feeder bays connecting into the ZA Route No.1 circuit (COCK-ECCL)
- Space for 2 x 400 kV feeder bays connecting into the ZA Route No.2 circuit (COCK-ECCL) for SPT-RI-2417
- Space for 2 x 400 kV feeder bays connecting into the GALN-TEVI/ETTR 400 kV circuit under SPT-RI-2417
- Space for 2 x 400 kV feeder bays for future Harburn double circuit under SPT-RI-3884
- 2 x 400 kV bus section circuit breakers
- 2 x 400 kV bus couplers
- 2 x 400 kV transformer bays for SPT-RI-2080
- Space for 1 x 400 kV transformer bays for SPT-RI-3644, for the [redacted] Connection
- Space for 1 x 400 kV transformer bays for offer currently out for acceptance
- Space for 4 x spare 400kV feeder bays (2 x each end of the substation)

The 132 kV scope of SPT-RI-2080 is noted below, and shown graphically in Figure 7 in pink:

- 2 x 132 kV transformer feeder bays
- 1 x 132 kV bus section circuit breaker
- 1 x 132 kV bus coupler
- 2 x 132 kV feeder bays for connections into the Dunlaw Extension
- 1 x 132 kV feeder bay for connection to Galashiels
- 1 x 132 kV feeder bay for connection to Eccles
- Space for 1 x 132 kV feeder bay for connection of [redacted]
- Space for 1 x 132 kV feeder bay for connection of [redacted]
- Space for 2 x 132 kV transformer feeder bays for future DNO 33kV connections

Note, that the OHL connection to Dunlaw Extension is not included within the scope of this EJP.

Common works for both reinforcement instructions are:

- All associated protection and control works.
- All associated environmental and civil works.
- Miscellaneous works.

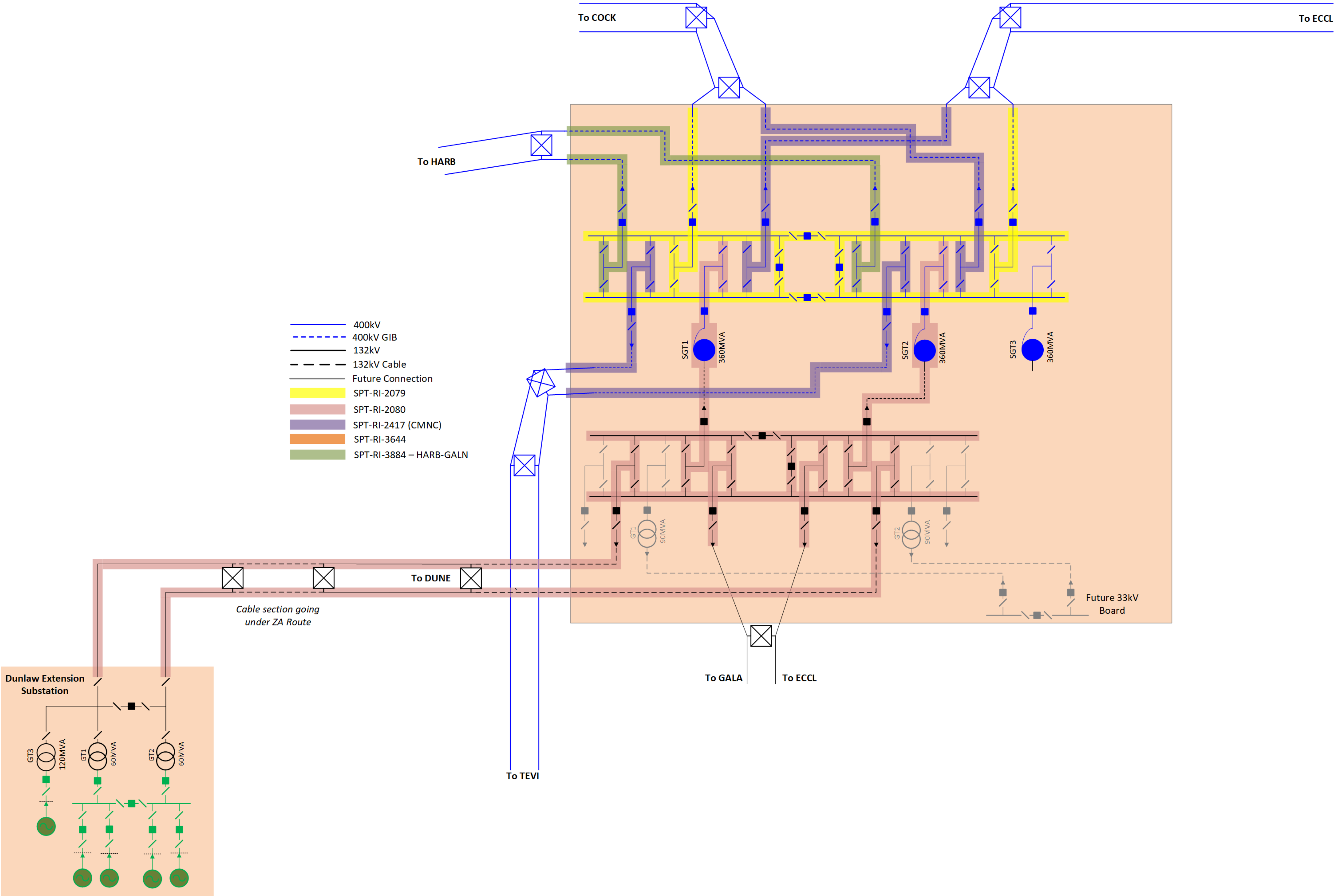


Figure 7 Single Line Diagram for the Gala North 400/132 kV Substation – SPT-RI—2079 and SPT-RI-2080

3.2.1 Options Appraisal Technology Type

This options appraisal section considers the relative merits of an AIS and GIS 400 kV switchgear alongside the 132 kV options for AIS and GIS technology types.

While Gala North is a greenfield site, there are a wide range of factors that must be considered when identifying a suitable location for the new substation:

- The extent of the initial substation design and allowance for future expansion.
- Accessibility via existing road network.
- Ground conditions and topography of a site as they will affect the civils engineering and earthworks required.
- The current land use and environmental designations on and around the site.
- The proximity to existing overhead line routes that are proposed to connect to the new substation.
- The alignment of the new overhead line routes that are proposed to connect to the new substations.
- The effect on the present owners of the land identified for the new substation.
- The effect on the community during the construction and operational stages of the substation's life.

Extensive, co-ordinated line routing and substation siting exercises were undertaken to identify candidate sites that could accommodate the new, incoming 400kV and 132kV overhead line routes, the turn-in of the existing ZA route 400kV overhead line and the switchgear and transformer requirements of the new substation. Further, the substation location had to consider the 400kV and 132kV generation connections contracted in the area in an economical, efficient and co-ordinated way.

The key criteria of the completed siting exercise were:

- Sufficient space for a 16 bay 400kV substation, to include two bus sections, two bus couplers, with space for two spare bays on either side of the substation (four in total);
- Sufficient space for a 12 bay 132kV substation, to include a bus section, a bus couplers, with space for two spare bays on either side of the substation (four in total);
- Sufficient space for 4x 400/132kV 360MVA transformers;
- Connectivity to existing ZA route and P Route (location where both routes meet shown in Figure 8).
- Connectivity to new 132kV OHL between Dunlaw and Galashiels (preferred route corridor, carried out via separate routing exercise shown in Figure 9 below).
- Given that the future 400kV circuits proposed as part of the tCSNP2 require new corridors to the west of ZA route, it is preferred that identified sites are to the west of ZA to prevent the circuits crossing.

[redacted]

Figure 8: Existing ZA and P Routes in Galashiels area

[redacted]

Figure 9: new 132kV corridor between Dunlaw and Galashiels

Using the above criteria, five options were identified as shown in Figure 10. Each were considered for technical, environmental and economic merit and the preferred location was chosen as the best option for the establishment of the new 400/132kV substation. The site shown in Figure 11 was that which best achieved the required connectivity subject to the constraints of the land use in the area.

[redacted]

Figure 10: Options considered for new substation site

The identification of a suitable site then enabled consideration of the design options which included AIS and GIS.

Whilst the use of the 400 kV AIS switchgear technology would allow for the connection of the offers detailed in Table 1, as well as providing reinforcement and additional capacity in the Borders region and B6 boundary, there is a substantial difference in the overall footprint required for the 400 kV AIS Substation versus the GIS option to support the required 16-bay substation solution. Using the red-line boundary as shown in Figure 11, different configurations of substation have been studied to determine if they are feasible:

Option 1: Appendix A, Figure 13, includes a standard GIS double busbar configuration, laid out for all required bays, including for CMN3 and HGNC future bays, and a minimum of 2 spare bays at either end of the 400kV substation for future expansion (with additional space within the site for refinement ahead of final GIS design). The substation fits comfortably within the chosen site, within the boundary required to maintain the local water course and to the adjacent existing road, and there is additional space for any future operability type devices that will be determined through further system analysis. The layout shows three SGTs, as per the current contracted position, but the layout lends itself to the fourth SGT that is likely to be required at the site.

Option 2.1: As per Appendix A, Figure 14, a standard AIS double busbar configuration will not fit in the preferred site, noting the water course to the north as well as wetland east and south of the site and the existing road that runs to the west of the site that must be maintained. With regards to the watercourse, SEPA advise a boundary of 50m to the substation fence line must be maintained, and there is an additional 20m required between the fence and substation requirement. To ensure diversity of circuits across the substation, a significant amount of GIB is required for this option, which adds cost and complexity to the site, and there is no space for spare bays or additional operability type equipment that may be required to accommodate the tCSNP2 projects. Additionally, there is limited space within the substation for a fourth 400/132kV, which is currently out for acceptance in a connections offer. As a result, this option has been discounted ahead of full cost exercise.

Option 2.2: In Appendix A, Figure 15 , a second AIS solution has been considered, which consists of a 'wraparound' solution. This option makes better use of the space on the site, and allows for three spare bays to be included, which may then allow for operability equipment to be added at the site if required. There is no further space for additional spare bays should they be required in the future. It should however be noted that in this option, space is still limited for a fourth SGT, and the 70m limit to the existing water course is exceeded in a number of places around the site. On the diagram, the earth works required to establish the site have been marked on, to demonstrate this proposal encroaches into the watercourse and the adjacent road. Additionally in Figure 16 this solution has been overlaid with the red line boundary. The encroachments into the water course and with the road can be seen clearly here. Moving the platform further south to avoid the water course would remove the space marked for the spare bays, resulting in no future options for expansion. As a result, this option is not feasible at the site, as it does not keep the substation within the limitations of the site, and does not offer the future expansion options of the GIS alternative. Although this is not suitable, the option was taken forward to be costed for an economic comparison with the equivalent GIS solution.

Given the civil engineering and associated environmental challenges and the incremental cost for utilising AIS switchgear, as discussed above, it is expected that the use of AIS will add an additional 6 months (as a minimum) to the programme, which will impact the connection dates of all new developments into the new substation. The additional costs of the project, had it been feasible (which due to the discussion above, is not) are £8.1m due to the overall increase in footprint required versus the GIS option. Therefore, due to this and limited future expansion, it is recommended that to support economic, efficient and coordinated development of the future network itself, that the GIS technology type is the correct solution.

There is not a substantial difference in the overall footprint required for the 132 kV AIS Substation versus the GIS option to support the required 12-bay substation solution, as the total footprint area of the 132 kV substation is dominated by the four 360 MVA SGTs located within the substation fencing. It is therefore considered that the civil engineering and associated environmental planning challenges between the GIS and AIS options are roughly similar and the incremental cost for this option due to the introduction of the GIS technology type lends itself to an AIS solution.

Therefore, it is recommended that the Gala North 400/132 kV substation utilises 400 kV GIS technology, to minimise the space required for the substation and reduce overall civils cost; and to utilise 132 kV AIS technology because it is feasible and the cost differential is marginal. The estimated total cost for this option is £158.45m. It would allow for the connection of the contracted developments detailed in Table 1 as well as providing reinforcement and additional capacity in the Borders region and B6 boundary.

3.3. Selected Option

As detailed in previous sections, the most appropriate option to provide future connection capabilities and transmission reinforcement in the Borders Region is the establishment of a 400 kV substation, Gala North, to facilitate connection to the wider network as part of CMN3 and HGNC, and to connect the [redacted] and an offer currently out for acceptance. The 132 kV Gala North Substation will provide a point of connection to connect the contracted generation of the [redacted], and [redacted].

The Gala North 400/132 kV substation is proposed to be located at coordinates [redacted], as can be seen in Figure 11, due to the relative proximity to the proposed 400 kV CMN3 route, shown in pink, the existing 400 kV ZA Route between Eccles and Cockenzie, shown in Blue, and the proposed, re-built 132 kV P Route to be established under SPT-RI-2080. The 400 kV substation and 132 kV substation will be constructed under SPT-RI-2079 and SPT-RI-2080 respectively, the scope of which is noted in Section 3.2. The substation platform size is approximately [redacted], and the indicative layout of the substation is shown in Figure 12.

Given the volume of connections within the Borders area, and the scheduled CMN3 works, the Gala North 400 kV and 132 kV substations have been considered in parallel in terms of determining an appropriately sized substation platform.

The 132 kV and 400 kV voltage levels at Gala North have been developed employing AIS and GIS respectively as shown in Figure 12. With respect to the 132 kV substation the size of the substation platform is dominated by the installation of the 400/132 kV SGTs therefore the use of GIS was considered but discounted because of the higher initial cost without providing material benefit in overall space saving given the required SGTs. The 400 kV infrastructure, is proposed to utilise a GIS substation because the available space within the substation red line boundary is limited and a 400 kV AIS solution could not be implemented to accommodate the additional feeder bays for the CMN3 circuits as well as the required 400 kV bus sections and bus couplers to give the required operational flexibility.

The use of 400 kV GIS equipment would also provide sufficient switchgear rating taking into account that Gala North 400 kV substation will be a key node on a new export corridor between SPT and NGET, for which the required rating of the switchgear will be 5000A. This switchgear rating can be readily achieved using GIS equipment as the available standard products such as instrument transformers are rated to this level. At present, the availability of 5000A SF_6-free AIS circuit-breakers is not certain.

Noting the spatial constraints of the selected location, a 400 kV GIS solution provides additional space to accommodate strategic investment in the form of additional spare 400 kV bays for future connections in the area. In addition to reduction in the required area for switchgear compared to an AIS solution, the proposed GIS solution also facilitates flexibility in the alignment of overhead line entries and the correct disposition of circuits to busbar sections to ensure compliance with Chapter 4 of the NETS SQSS which can only be achieved in an AIS substation by extensive cable works with the associated cost impacts. A cost estimate for the 400 kV GIS/ 132 kV AIS solution is £158.45m which is £4m less than when compared to the 400 kV AIS option, which regardless is infeasible within the chosen site.

[redacted]

Figure 11: Gala North 400/132 kV - Proposed Substation Location, [redacted]

[redacted]

Figure 12: Gala North 400/132 kV Substation - Proposed Layout, including a fourth SGT which is currently out for acceptance

Options	Map	Layout of Substation/ Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Risks	Narrative Preferred Option	Narrative Rejection
Preferred – Option 1: Gala North 400 kV GIS double busbar / 132kV AIS	Refer to Figure 11	Refer to Figure 12	N/A	N/A	Early engagement with landowners and environmental bodies to secure necessary site permissions.	Necessary option to facilitate wider CNM3 works and enable local generation works whilst minimising land area and cost.	N/A
Rejected – Option 2 Gala North 400 kV AIS double busbar / 132kV AIS			N/A	N/A	Early engagement with landowners and environmental bodies to secure necessary site permissions.	N/A	Spatial restrictions at the site mean that development of a 400 kV AIS solution is inconsistent with the flexibility required for the CMN3 route.
Rejected – Option 2 Gala North 400 kV AIS wrap around busbar / 132kV AIS			N/A	N/A	Early engagement with landowners and environmental bodies to secure necessary site permissions.	N/A	Spatial restrictions at the site mean that development of a 400 kV AIS solution is inconsistent with the flexibility required for the CMN3 route.
Rejected – Baseline: Do Nothing / Delay	N/A	N/A	N/A	N/A	N/A	N/A	Inconsistent with SPT's various statutory duties and licence obligations.

System Design Table	Circuit/Project	**Preferred – Option 1:** Gala North 400 / 132 kV Substation – GIS/AIS	**Rejected – Option 2.1:** Gala North 400 double busbar / 132 kV Substation – AIS/AIS	**Rejected – Option 2:** Gala North 400 wraparound busbar / 132 kV Substation – AIS/AIS	**Rejected – Baseline:** Do Nothing / Delay
Thermal and Fault Design	Existing Voltage (if applicable)	N/A	N/A	N/A	N/A
	New Voltage	400/132 kV	400/132 kV	400/132 kV	N/A
	Existing Continuous Rating (if applicable)	N/A	N/A	N/A	N/A
	New Continuous Rating	5000 A / 2500A	5000 A*/ 2500A	5000 A*/ 2500A	N/A
	Existing Fault Rating (if applicable)	N/A	N/A	N/A	N/A
	New Fault Rating	63 kA / 40 kA	63 kA / 40 kA	63 kA / 40 kA	N/A
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A	N/A	N/A	N/A
	New MVAR Rating (if applicable)	Dependent on further system analysis	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)	N/A	N/A	N/A	N/A
	2050 Future Demand	N/A	N/A	N/A	N/A
	Present Generation (if applicable)	N/A	N/A	N/A	N/A
	Future Generation Count	8	8	8	N/A
	Future Generation Capacity	811.9 MW	811.9 MW	811.9 MW	N/A
Initial Design Considerations	Limiting Factor	Land availability	Land availability	Land availability	N/A
	AIS/ GIS	GIS / AIS	AIS / AIS	AIS / AIS	N/A
	Busbar Design	Double busbar	Double busbar	Double busbar - wraparound	N/A
	Cable/ OHL/ Mixed	OHL / Cable	OHL / Cable	OHL / Cable	N/A

	SI	This option allows for minimum four spare 400kV bays at either end of the site, bays for tCSNP2 schemes and future operability projects (subject to further analysis).	tCSNP2 schemes included in layout, but no spare bays or space for operability devices.	tCSNP2 schemes included in layout, but limited to three spare bays or space for operability devices.	N/A

*Assumes that 5000A 400kV AIS switchgear becomes commercially available ahead of substation tender.

4. Proposed Works and Cost

4.1. Project Summary

The selected option details the installation of a 400 kV GIS substation, Gala North, with an accompanying 2 x 400/132 kV 360 MVA SGTs connected to one 132 kV double busbar, Gala North 132 kV AIS substation. This will be delivered in a single stage to ensure the project is delivered in a safe and timely manner. It is proposed to connect the [redacted] and [redacted] to the 132 kV Gala North AIS substation, and the [redacted] connection and a further offer out for acceptance to the 400 kV GIS substation via 2 x 400/132 kV 360 MVA SGTs.

The single line diagram for the delivery stage of SPT-RI-2079 and SPT-RI-2080 is shown in Figure 7.

The associated works for development of SPT-RI-2079 and SPT-2080 are detailed below:

<u>Pre-Engineering Works</u>
The following list is indicative based on previous experience of such sites and as such should not be read as definitive. The following surveys will be carried out:

- Topographical survey of the site
- GPR survey of areas to be excavated to validate approximate locations of buried services.
- Ground bearing capacity checks
- Geo Environmental Investigation to identify the relevant geotechnical parameters to facilitate the civil engineering design works
- Earthing Study
- Insulation Co-ordination Study
- Transport Survey to assess the access of the new equipment
- Environmental Study.

<u>Gala North 400 kV GIS Substation and 132 kV AIS Substation</u>

The works at Gala North 400 kV substation shall, as indicated in Figure 7, include:

- Installing a new 400 kV DBB with 16 bays including space for 2 × bus couplers, 2 × bus sections, 4 × 400/132 kV 360 MVA SGTs, 2 × feeder bays for CMN3 route 400 kV circuits, 4 x 400 kV feeder bays for connection to the ZA route, 2 x feeder bays for the future Harburn, and 2 x feeder bays to facilitate local generation sites [redacted] and a further generator out for acceptance).
- Installing a new 132 kV DBB with 12 bays, including space for 2 x 132 kV transformer feeder bays, 1 x 132 kV bus coupler, 1 x bus section, and 2 x feeder bays for connection to the Dunlaw Extension, 2 x feeder bays for connection to Galashiels and Eccles respectively, 1 x 132 kV feeder bay for connection of [redacted] 1 x 132 kV feeder bay for connection of [redacted], 2 x 132 kV feeder bay for connection to future 132/33 kV transformers to facilitate DNO connections in the area.

4.2. Estimated Total Project Cost

A Business Plan provision and estimated cost of the project is indicated in the following table.

Project costs are summarised in the Cost Breakdown below:

Table 7: Project Cost Breakdown

Item	Description	Estimated Direct CAPEX (£m 23/24)
[redacted]		
[redacted]		
[redacted]		
[redacted]		
[redacted]		

5.

Expenditure incidence is summarised below:

Table 8: Summary of Expenditure Incidence

OSR	Energisation Year	Yr. 2023: Direct CAPEX	Yr. 2024: Direct CAPEX	Yr. 2025: Direct CAPEX	Yr. 2026: Direct CAPEX	Yr. 2027: Direct CAPEX	Yr. 2028: Direct CAPEX	Yr. 2029: Direct CAPEX	Yr. 2030: Direct CAPEX	RIIO-T2 Total: Direct CAPEX	RIIO-T3 Total: Direct CAPEX	Total: Direct CAPEX
SPT200642	2029	£0.06	£0.05	£0.18	£1.97	£9.77	£44.85	£35.77	£13.55	£2.25	£103.94	£106.19
SPT200495	2029	£0.00	£0.20	£0.08	£0.15	£9.10	£29.74	£13.00	£0.00	£0.43	£51.83	£52.26

4.3 Further Development at the New Substation

Indicators from SP Distribution's Distribution Future Energy Scenarios (DFES) indicate growth in both demand and generation going forward in the area local to this proposed new substation, therefore provision will be made at the site to allow the establishment of a new grid supply point (GSP) which can be interconnected with the existing local distribution system to provide additional capacity (shown in Figure 11 above. Engagement with SPD on this will continue as the project develops, to ensure the best solution for the GB consumer, at both Transmission and Distribution levels.

4.4 Regulatory Outputs

The indicative primary asset outputs are identified in table below:

Table 9: In Scope Indictive Primary Asset Outputs

Asset Category	Asset Sub-Category Primary	Voltage	Forecast Additions[9]	Forecast Disposal
Substation Platform	Platform Creation	400/132 kV	1 unit	-
Circuit Breaker	CB	400 kV	6 units	-
Circuit Breaker	CB	132 kV	8 units	-
Switchgear	Disconnector	400 kV	14 units	-
Switchgear	Disconnector	132 kV	20 units	-
Wound Plant	Transformer	400/132 kV (360MVA)	2 units	-

5 Deliverability

We have applied SPT project management approach to ensure that this project work is delivered safely, and in line with the agreed time, cost and quality commitments. We have a proven track record of delivering essential transmission network upgrade projects and will draw upon this knowledge and experience to effectively manage these works. We have assigned a dedicated Project Manager to the works at every stage who is responsible for overall delivery of the scope and is the primary point of contact for all stakeholders.

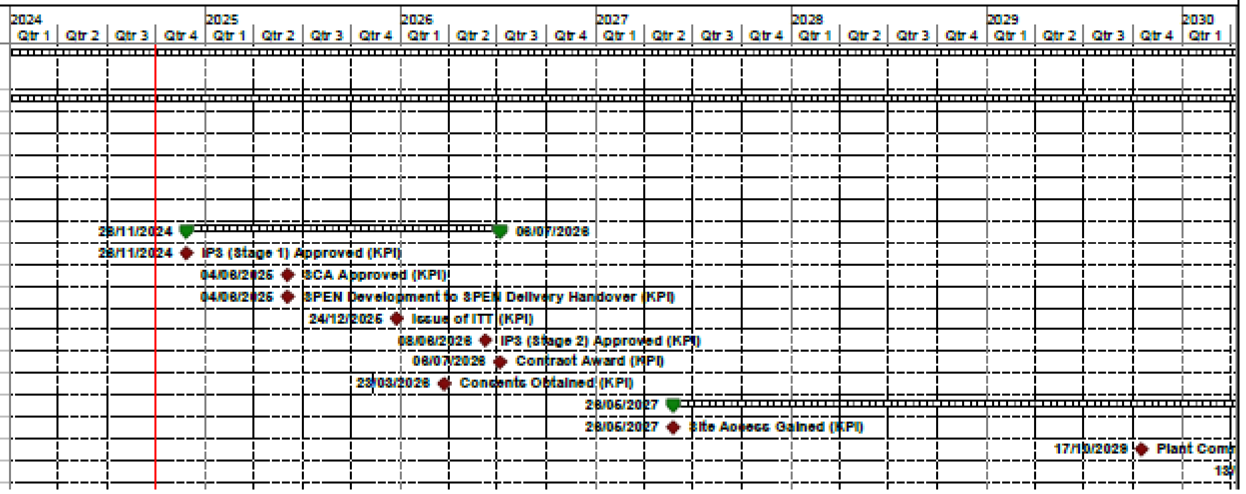
5.3 Delivery Schedule

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 below summarises the key milestones within the delivery schedule of this project.

[9] Forecast Additions are indicative pending further detail design.

Table 10: Summary of Key Milestones within the Project Delivery Schedule

ID	Task Name	Duration	Start	Finish	% Comp	Predecessors	Successors
0	**Galashiels North 400kV Substation (TORI 2079) and 132kV Substation Scope (TORI 2080)**	**2158 d**	**Mon 07/02/22**	**Tue 13/08/30**	**6%**		
1	**Key Milestones**	**2158 d**	**Mon 07/02/22**	**Tue 13/08/30**	**0%**		
2	**Project Design / Environmental Planning**	**45 d**	**Mon 07/02/22**	**Fri 08/04/22**	**100%**		
3	Project Start	0 d	Mon 07/02/22	Mon 07/02/22	100%		22,20FS+20 d
4	IP1 Approved (KPI)	0 d	Mon 07/02/22	Mon 07/02/22	100%	22	522SS
5	IP2 Approved (KPI)	0 d	Fri 04/03/22	Fri 04/03/22	100%	23	523SS,525SS
6	Consents Process Started (KPI)	0 d	Fri 08/04/22	Fri 08/04/22	100%	36SS	
7	**Engineering Development / Contract Placement**	**403 d**	**Tue 26/11/24**	**Mon 06/07/26**	**0%**		
8	IP3 (Stage 1) Approved (KPI)	0 d	Tue 26/11/24	Tue 26/11/24	0%	32	509SS,526SS,528SS
9	SCA Approved (KPI)	0 d	Wed 04/06/25	Wed 04/06/25	0%	151	10,529SS,531SS
10	SPEN Development to SPEN Delivery Handover (KPI)	0 d	Wed 04/06/25	Wed 04/06/25	0%	137,9	
11	Issue of ITT (KPI)	0 d	Wed 24/12/25	Wed 24/12/25	0%	254	512SS,510SS,532SS,534SS
12	IP3 (Stage 2) Approved (KPI)	0 d	Mon 08/06/26	Mon 08/06/26	0%	210	
13	Contract Award (KPI)	0 d	Mon 06/07/26	Mon 06/07/26	0%	257	513FS-20 d,535SS,537SS
14	Consents Obtained (KPI)	0 d	Mon 23/03/26	Mon 23/03/26	0%	86	
15	**Delivery**	**816 d**	**Wed 26/05/27**	**Tue 13/08/30**	**0%**		
16	Site Access Gained (KPI)	0 d	Wed 26/05/27	Wed 26/05/27	0%	467SS	515SS,538SS,540SS
17	Plant Commissioned (KPI)	0 d	Wed 17/10/29	Wed 17/10/29	0%	481,484	541SS,543SS
18	IP6 Signed Off (KPI)	0 d	Tue 13/08/30	Tue 13/08/30	0%	495FF	544SS



all be undertaken to assess the ongoing effectiveness of the Project Management interfaces.

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

5.4 Risk and Mitigation

A Project Risk Register was generated collaboratively during the initial project kick-off meeting 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 by the project team. Currently, the top scheme risks are:

- Ground Conditions – Ground investigations have not been carried out for the Gala North Substation. Poor ground conditions could have a great impact on the foundation/platform design and as a result incur further cost and time.
- Servitudes, Lease, Wayleaves – Land rights need to be agreed in a timely manner
- Servitudes, Lease, Wayleaves – Dependent upon the outcome of discussion with the Land Owner, a compulsory purchase order may be required. If a compulsory purchase order is required, significant time delays would be expected alongside additional cost to the project.
- Customer / 3rd Party Changes or Delays – The environmental schedule is delayed by three months from planned original submission which places a key milestone risk in submission of the S37 application on time.
- Customer / 3rd Party Changes or Delays – EIA consultation responses may result in changes to the impact of the current layout/location/design of the Gala North substation. This is likely to incur cost and timescale overruns if designs are required to be changed.

5.5 Quality Management

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

5.5.1 Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product are detailed in the Project Risk Register. The suppliers of main equipment may also receive a Factory Acceptance Test Inspection when the asset is being built.

5.6 Quality Requirements in Tenders

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

5.6.1 Monitoring and Measuring During Project Delivery

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

The following inspections are completed:

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

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

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

5.6.2 Post Energisation

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

5.7 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.

5.8 Stakeholder Engagement

SPT is committed to delivering optimal solutions in all the projects we undertake. A key part of this is engaging with relevant stakeholders throughout the project development and delivery process. Stakeholders can include customers, regulatory bodies and other statutory consultees, national and local government, landowners, community groups, and local residents and their representatives (e.g., MPs, MSPs and councillors). Community impacts associated with construction activities are considered at project initiation by completion of a Community Communications Plan, which details the stakeholders relevant to the project, the communication channels that will be used to engage with them, the information that will be provided to and sought from them, and the timescales over which this will happen. It considers any sensitivities that may require increased stakeholder consultation and details specific events that will be held with stakeholders during the development of the project.

As part of this project, SPT will engage with statutory consultees associated with the planning application for these works - the Local Authority, SEPA and Nature Scot - and the third-party landowner.

6 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 both thresholds, however, is not suitable due to:

- Being significantly developed, therefore not suitable for early competition.
- A number of new connections projects are dependent on the completion date, therefore delays through any project tender exercise will delay these projects.
- Coordination required with tCSNP2 projects, HGNC and CMNC, which are both proposed to connect into Gala North 400kV.
- Overhead line works are required on existing SPT circuits, which are not separable and would reduce each project cost to below either competition threshold.

7 Conclusion

This EJP demonstrates the need to establish the new Gala North 400/132 kV substation. This reinforcement scheme primarily serves as enabling work required for connection of 2069 MW of contracted renewable generation in the Borders region of Scotland, providing a new point of interconnection in the region.

Construction of the proposed Gala North 400 kV substation can form part of the 400 kV double circuit corridor between Scotland and the North of England (with the project reference CMN3).

The main conclusions of this submission are:

- It is necessary to invest in transmission infrastructure in creation of the Gala North 400/132 kV Substation, to enable the connection of 811.9 MW of contracted renewable generation, this having been identified as the most economic and efficient option.
- The staging of the construction of the proposed Gala North 400/132 kV substation has been established to reflect the growing needs in the area and enable the timely and efficient connection of contracted generation as well as future network needs i.e. the expansion of the 400 kV system.
- The proposed reinforcement scheme plays a vital role in reaching legislated net zero targets and is aligned with SPT's RIIO-T3 strategic goals.

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.

Appendix A – Alternative Substation Layouts

[redacted]

Figure 13: 400kV GIS double busbar option

[redacted]

Figure 14: 400kV AIS Double Busbar Option

[redacted]

Figure 15: 400kV AIS Wraparound option

[redacted]

Figure 16: 400kV AIS Wraparound with Red Line Boundary