Dumfries North 400kV Substation

Site Strategy EJP
Version: Issue 1
11/12/2024

SP Energy Networks
RIIO-T3 Business Plan

SP Energy Networks

Dumfries North 400kV Substation				
Name of Scheme	Dumfries North Substation			
Investment Driver	Local Enabling (Entry)			
BPDT / Scheme Reference Number	SPT200906			
Outputs	• 400 kV Platform Creation – 1 unit • 400 kV CB (Gas Insulated Busbar - TBC) – 23 units • 400 kV < 500MVA Wound Plant (Transformer) – 1 unit • 400 kV Switch Disconnector – 65 units			
Cost	£42.54m			
Delivery Year	2036			
Applicable Reporting Tables	BPDT (5.1 Project_Meta_Data, 6.2 Scheme_C&V_Calc_NonLoad_Actuals and 10.11 Contractor Indirects)			
Historic Funding Interactions	N/A			
Interactive Projects	N/A			
Spend Apportionment	**ET2**	**ET3**	**ET4**	**ET5**
	£0m	£2.18m	£33.85m	£6.51m

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1. Introduction

This engineering justification paper supports SP Transmission's plans to establish a new 400kV substation at Dumfries North to uprate and reinforce transmission capabilities, co-ordinated with the WCN2 scheme, as well as enable a number of connections around the Dumfries and Southern Scottish area. While not part of the scope of WCN2, Dumfries North will require careful co-ordination with that project to ensure that the most economical, efficient and co-ordinated solution is developed.

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 optioneering 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 license 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 SPT 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 400kV Dumfries North substation.

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 (NESO'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 the 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 to 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.

Furthermore, on the 4th November 2024, NESO published the 'Clean Power 2030' paper as advice to the UK government and OFGEM on how to achieve a low-carbon system. This publication further enhanced the need for us to continue to invest in our wider transmission network to ensure that targets around 2030 are met.

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

[1] British energy security strategy - GOV.UK (www.gov.uk)
[2] Onshore wind: policy statement 2022 - gov.scot (www.gov.scot)

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, NESO 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 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).

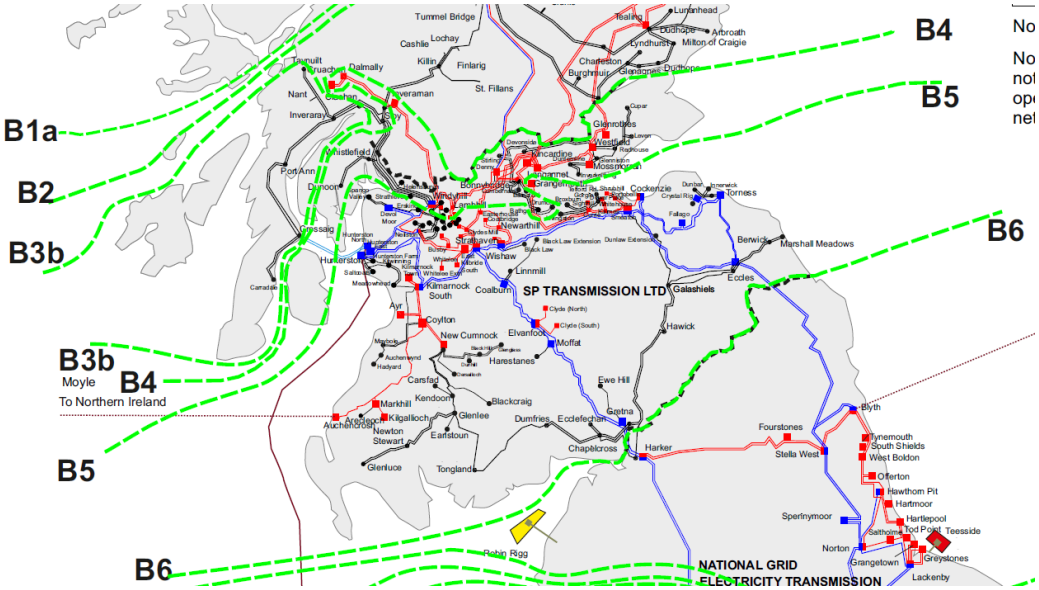

Figure 1: Network boundaries across SPT's network

The figure below (Figure 2) 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.

[3] Offshore Transmission Network Review
[4] OTNR - Generation Map

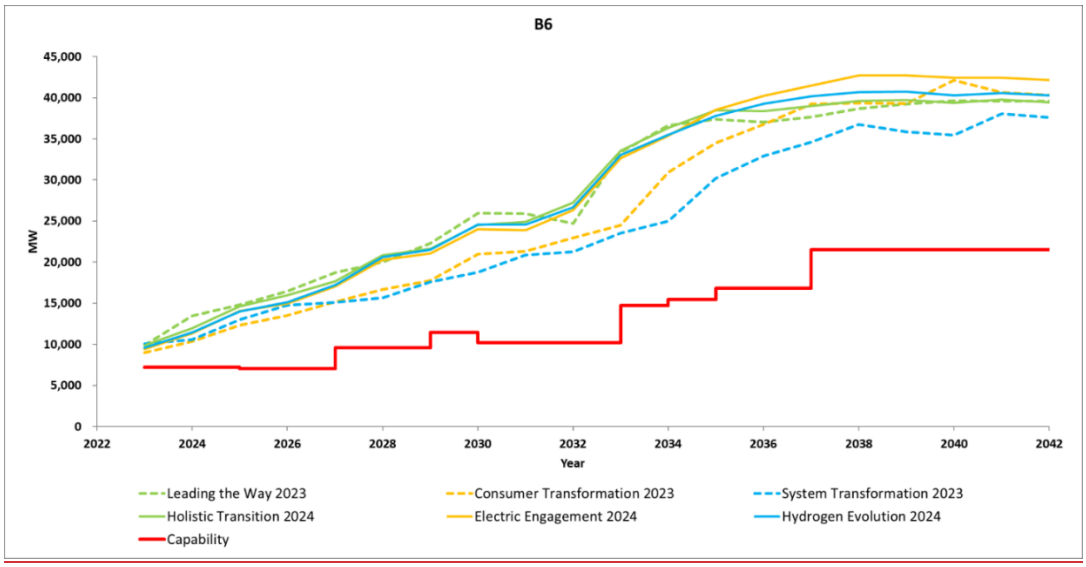

Figure 2: Required transfers and base capability for B6 boundary

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.

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.

2.4. Beyond 2030 Publication

Building upon NESO's Network Options Assessment (NOA) 2021/22 Refresh report[5] the recent publication of NESO'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 21 GW of low carbon generation to the UK 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 NESO 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 reinforcement has been identified to complement the proposed offshore network and provide a significant increase to the transfer capability of key system boundaries including B6.

A key onshore reinforcement identified is a new 400kV overhead line between southwest Scotland to northwest England. This project referred to as WCN2 within the Beyond 2030 Report is being

[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 NESO's Beyond 2030 Technical Report Final Strategic Options Appraisal (nationalgrideso.com)

jointly developed by SPT and NGET. WCN2 provides further B6 transfer capability as well as integrating onshore generation across central and southern Scotland.

2.5. The WCN2 Project

WCN2 provides an increase to the B6 transfer capability by establishing a new 400kV double circuit connection from the existing Kilmarnock South 400kV substation towards Harker substation within NGET's licensed area via new 400kV substations at Killoch, New Cumnock North, Glenmuckloch and Dumfries North (note that Dumfries North 400kV Substation does not form part of the WCN2 project).

The current proposal is to uprate the existing Kilmarnock South – Coylton – New Cumnock (XY/WA) 275kV double circuit to 400kV operation in order to reduce the element of new 400kV OHL build required . This requires establishment of new 400/275kV substations at Killoch (near existing Coylton) and New Cumnock North (near existing New Cumnock) in order to maintain supply to the existing 275kV network in Ayrshire and southwest Scotland.

South and east of New Cumnock WCN2 proposes establishment of a new 400kV double circuit route via Glenmuckloch (being progressed independently of WCN2). While not part of the scope of WCN2, its development has been co-ordinated with that of a new collector substation referred to as Dumfries North.

The majority of the WCN2 scheme when it is considered as its constituent parts is required to enable new onshore connections with ~2.2GW of active offers between New Cumnock, Coylton, Glenmuckloch and the Dumfries area. The planned WCN2 scheme is shown in Figure 3 with the blue line indicating the proposed 400 kV route (note that only Dumfries North 400kV substation is within the scope of this paper).

Figure 3: Planned WCN2 Scheme (Indicative only, subject to project development)

2.6. Existing System

The Dumfries area currently has a 132kV substation connected to Tongland, to the southwest, and Chapelcross, to the east. This 132kV station is used to supply multiple 33kV connections in the area and is close to capacity. The 132kV circuit is shown in Figure 4 and Figure 5.

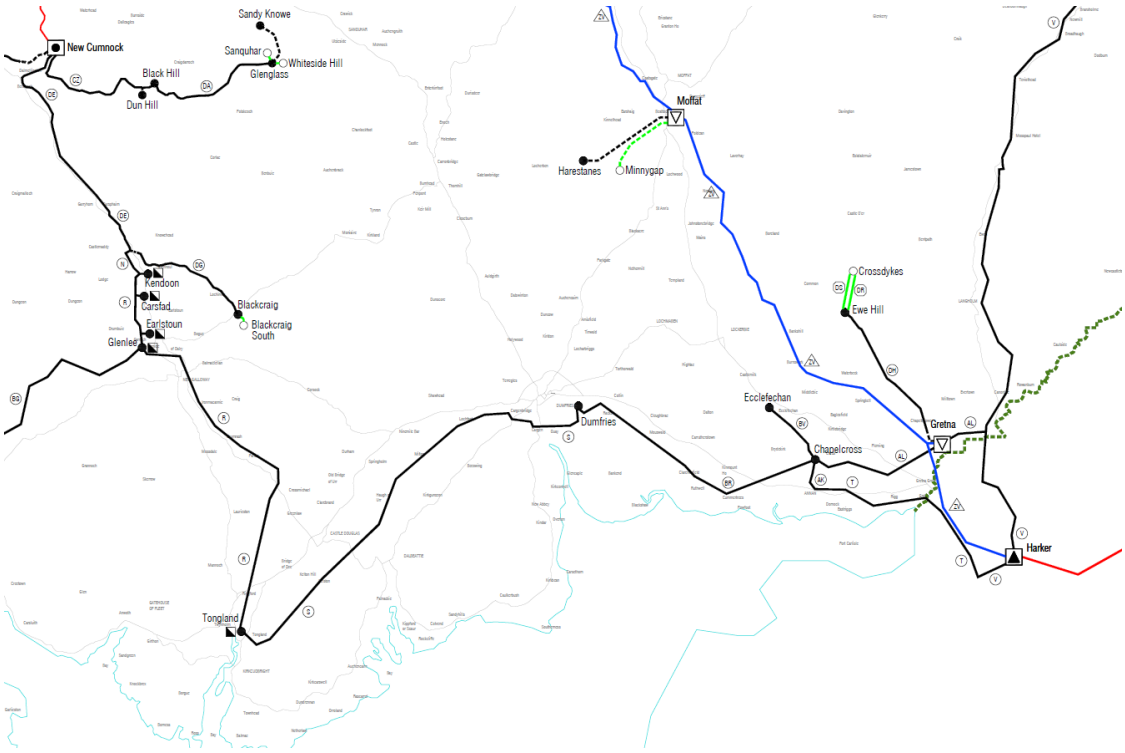

Figure 4: Existing Geographical Transmission Network in Area - Extracted from Networks Diagram Geographical Layout shown in Appendix A (Figure A-1)

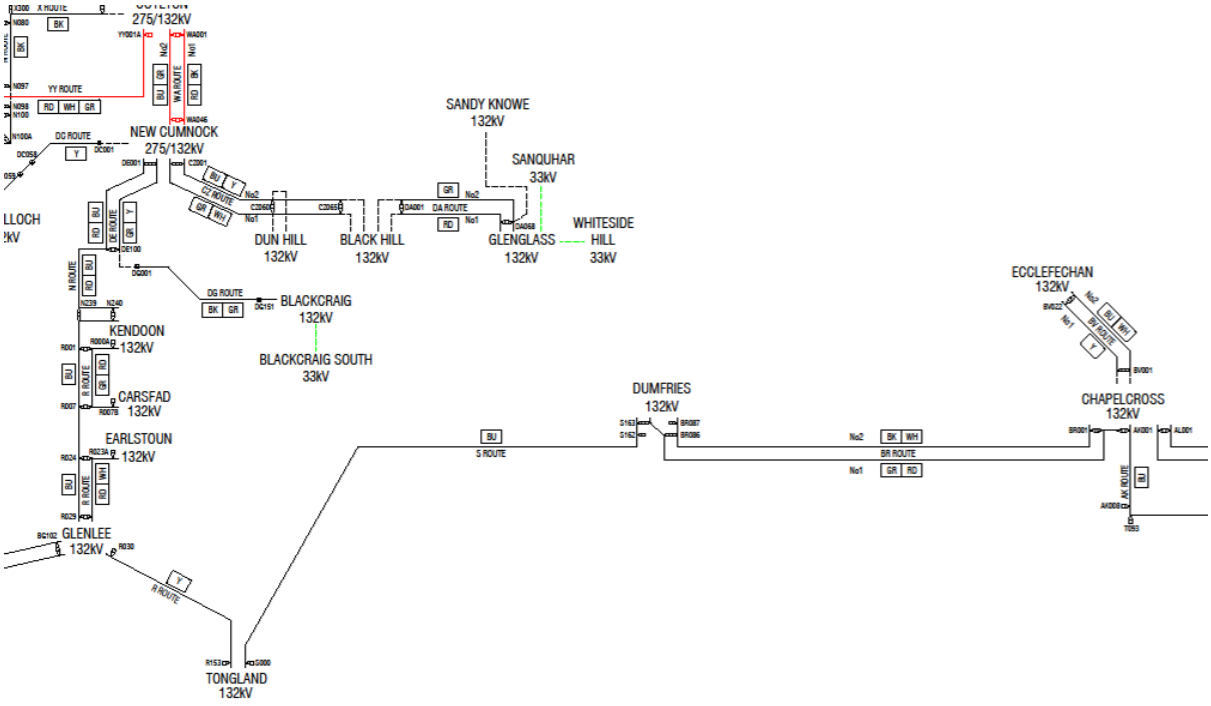

Figure 5: Existing SLD Transmission Network in Area - Extracted from Networks Diagram Geographical Layout shown in Appendix A (Figure A-2)

As shown in Figure 4 and Figure 5, there currently is no 400kV infrastructure in the surrounding region. The establishment of the 400kV circuit route required for the WCN2 scheme (see Figure 3) is proposed to be co-ordinated with a new 400kV substation (and associated OHLs) to be constructed at Dumfries North. This also includes provision for a 400/132kV SGT at Dumfries North to enable future connections and increase thermal capacity in the local region.

2.7. Wider System Upgrades

In order to facilitate new connections and uprate the transmission networks 400kV capacity within the South West Scotland region, several transmission works have been proposed of which SPT-RI-2862 (Development of Dumfries North 400kV Substation) is part of. These works are detailed in Figure 6 below:

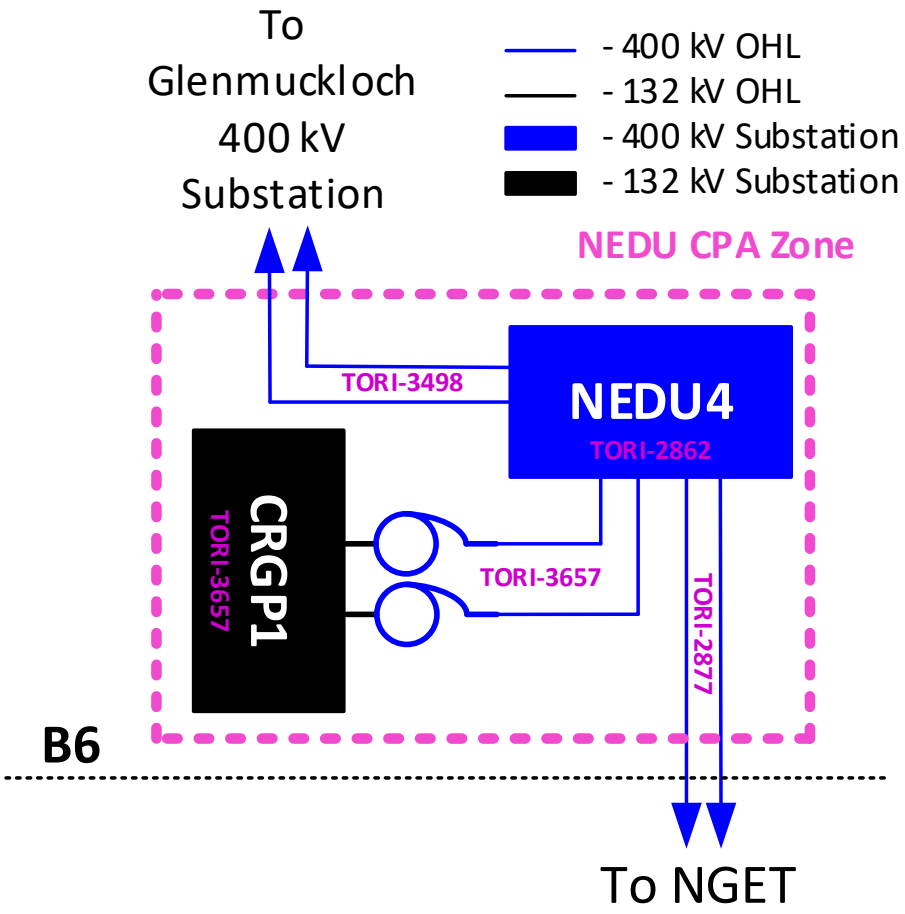

Figure 6: Proposed WCN2 Upgrades in Dumfries Area - Extracted from WCN2 SLD shown in Appendix A (Figure A-3)

The uprating of the network in the Dumfries region is shown to be reliant on a package of works being completed, including SPT-RI-2862. As is shown in Figure 6, the Dumfries North works are an integral part in the corridor for the Southwest to the B6 Boundary, providing a route for the 400kV transmission network while alleviating the generation constraints in a congested section of the network.

2.8. New Connections

There are currently 1041 MW of contracted generation to be connected directly via the proposed Dumfries North substation, 657 MW of which feature in the SPT best view based on our TECA

methodology connections with a score of 5 and above). This will not be possible without a package of network upgrades, including the development of a new 400kV substation in the Dumfries North area. The details of the contacted generation projects currently determined to be directly dependent on the aforementioned works are listed in Table 1.

Table 1: Contracted Generation Dependent Upon SPT-RI-2862 (Development of Dumfries North 400kV Substation)

Connecting Substation	Contracted Development	Consent Status	TECA Score	Contracted Energisation Date	SPT-RI-2862
[redacted]					
Total Capacity (MW)	-		-	-	**1041 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 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 the majority of projects directly dependent upon the works of SPT-RI-2862 will connect to the network, based on those categorised as high and medium probability to progress these works. This would indicate an increase of 657 MW being added to the network that are directly dependent on the works of SPT-RI-2862. Including the other, low probability connections, this total increases to 1041 MW. This covers generation that connects directly to the substation and, by extension, Craigenputtlock 132kV. This highlights the necessity of the Dumfries North 400 kV substation to allow for future connections.

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 South-West Scotland area as well as reinforce the B6 connection boundary for future transmission requirements. A summary of each option is described in is detailed at the end of section 3 as well as the system requirements and design parameters for the considered options.

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 options considered are high-level, focussing primarily on the necessary infrastructure required to facilitate the completion of the WCN2 scheme and allow for the connection of contracted generation (see Table 1). Future development will be completed once the scheme has matured to determine additional options (e.g. GIS v AIS, location, number of bays).

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 NESO. The proposed works are identified as Enabling Works in the connection agreements relating to the projects in Table 1.

3.2. Option 1 – ‘Dumfries North’ 400kV Substation

This option is to establish a new 400kV substation at Dumfries North. This shall be a double busbar (DBB) ‘Dumfries North’ 400kV substation and shall integrate with the development of the WCN2 scheme (currently under review). This option requires the following works (see Appendix A - Figure A-4 for SLD):

- At Dumfries North 400kV substation location, establish a new 400kV double busbar substation which shall connect onto both sides of the new 400kV double circuit to be established under SPT-RI-2877.
    - Installation of 23 bays:
    - 2 bays for new double circuit OHL to Glenmuckloch
    - 2 bays for new double circuit OHL to Wyseby/B6
    - 2 bus sections
    - 2 bus couplers
    - 2 bays for new double circuit OHL to Craigenputtlock
    - 1 bay for [redacted] SGT
    - 1 bay for new OHL circuit to [redacted]
    - 2 bays for a future GSP
    - 2 bays for a future Network Rail connection
    - 2 bays for 400 kV compensation
    - 1 bay for a 400/132kV SGT
    - 4 spare bays
- All associated protection and control works.
- All associated environmental and civil works.
- Miscellaneous works.

The estimated total cost for this option is £42.54m which includes only the works under SPT-RI-2862; the costs for elements related to Craigenputtlock (SPT-RI-3567), WCN2 (SPT-RI-2877 and SPT-RI-3498) and the respective connection infrastructure works are included in those schemes. It would allow for the connection of the generation offers detailed in Table 1 as well as providing reinforcement and additional capacity in the Dumfries area and across the B6 boundary. This option is currently technology agnostic with regards to the switchgear insulation type due to the development stage of the project.

The proposed site layout can be found in Appendix A-5 along with an accompanying geological survey in Appendix A-6.

3.3. Option 2 – Extend/Uprate Existing Dumfries 132kV Substation

This option was deemed unsuitable for several reasons. There is not enough space to extend the existing site as shown in Figure 7:

Figure 7: Geographical Site of Dumfries 132kV Substation

Due to the density of the surrounding land, existing road network/infrastructure, and relatively dense population, the option of extending or uprating the site is not feasible.

Figure 7 shows there is land on the outskirts of Dumfries which is more suitable for construction and for the completion of a 400kV corridor with incoming and outgoing overhead lines.

Figure 8: Land Use Criteria (Extract from Appendix A-6)

Lastly, due to the amount of contracted generation shown in Table 1 (657 MW of medium-high likelihood connections), a new substation is required as the existing station would be unable to enable these works.

3.4. Option 3 – Utilise/Extend Existing Moffat 400 kV Substation

This option investigated utilising an existing 400 kV substation in the surrounding area. Moffat substation is located approximately 22 km away from the area that is being examined for the proposed Dumfries North 400 kV site. Therefore, it could provide a viable alternative for the WCN2 route and contracted generation in the region. However, in practice, this is not a suitable solution. The primary reason is due to the lack of available capacity headroom and physical space at the site. Figure 9 below shows the current contracted position of the Moffat site:

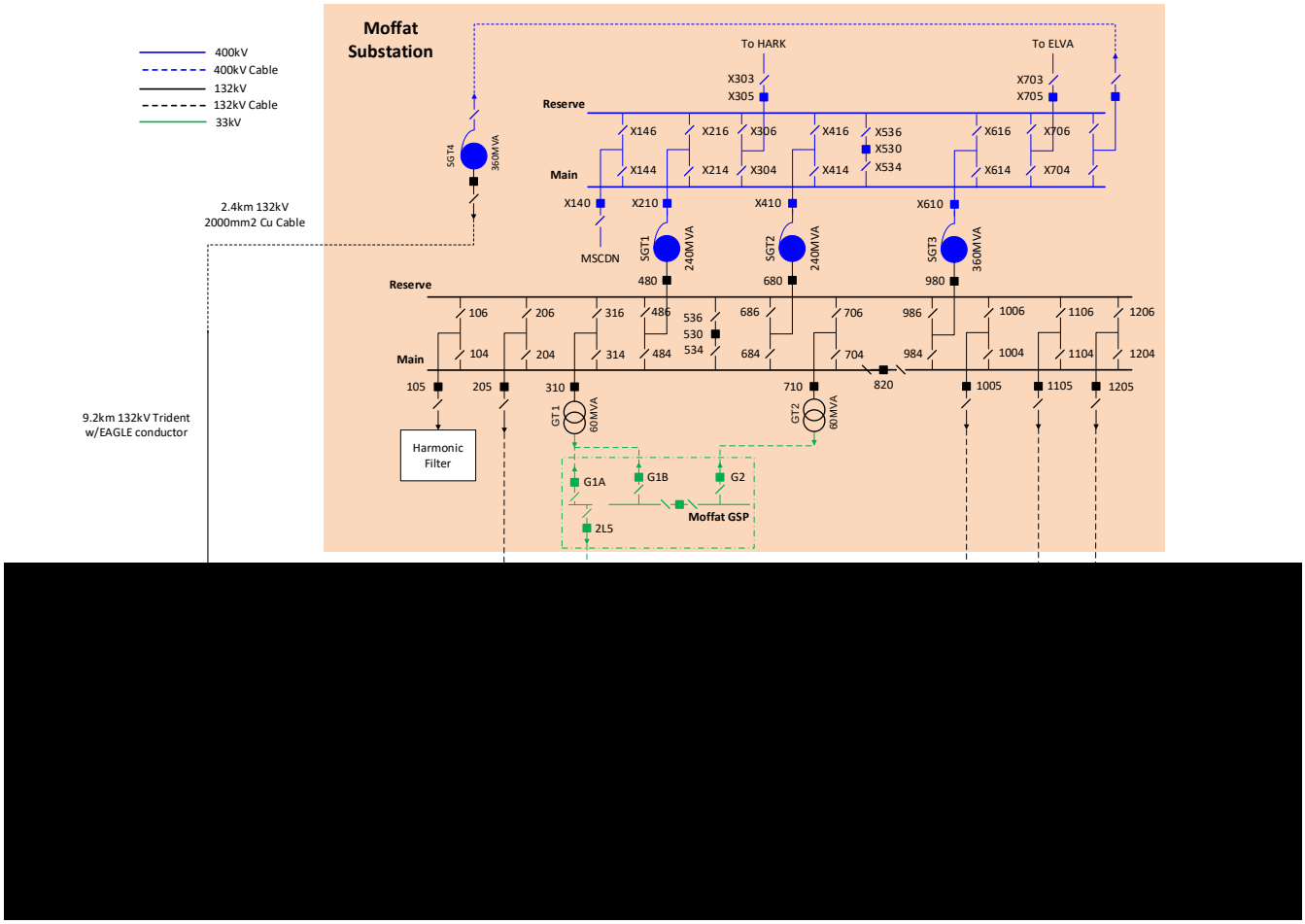

Figure 9: Contracted Position of Moffat 400 kV/132 kV Substation

As is shown in Figure 9, the site is already very congested and significantly extended from its original design. With the proposed inclusion of the [redacted], the export of the site would exceed 1800MW. Therefore, if the Moffat Bus coupler tripped an excess of 1800MW would be lost and thus exceed the infrequent infeed loss risk stated in the Security and Quality of Supply Standard (SQSS). This could be resolved by turning in the ELVA-GRNA circuit into the Moffat substation, providing a third infeed. However, due to the complications involved due to the series compensation in service and cost involved it was deemed unsuitable.

Additionally, there is no space at the site to accommodate future connections via the establishment of a collector arrangement served by the existing Elvanfoot-Moffat and Moffat-Gretna 400kV circuits.

The 400kV busbar split would be created and the “northern circuit” would connect through to the “southern circuit” with the circuit going to a collector substation being teed off this busbar arrangement. Subsequent design reviews have confirmed however that this arrangement is not feasible without a major extension to the substation to the east to provide the necessary busbar clearances. This platform extension to the east is not feasible given the Bear Holm wash located just outside the substation fence line. This, in combination with the infrequent infeed loss risk, requires future contracted generation to be located elsewhere/at a new site and thus invalidates this option.

3.5. Option 4 – Utilise/Extend Proposed Wyseby 400 kV Substation

This option intends to utilise the proposed Wyseby 400kV Substation, located close to the A74(M) near Gretna (see Figure 10):

Figure 10: Satellite Image Detailing the Proposed Wyesby 400 kV Substation Location

The current position of the substation and proposed works are shown in Figure 11:

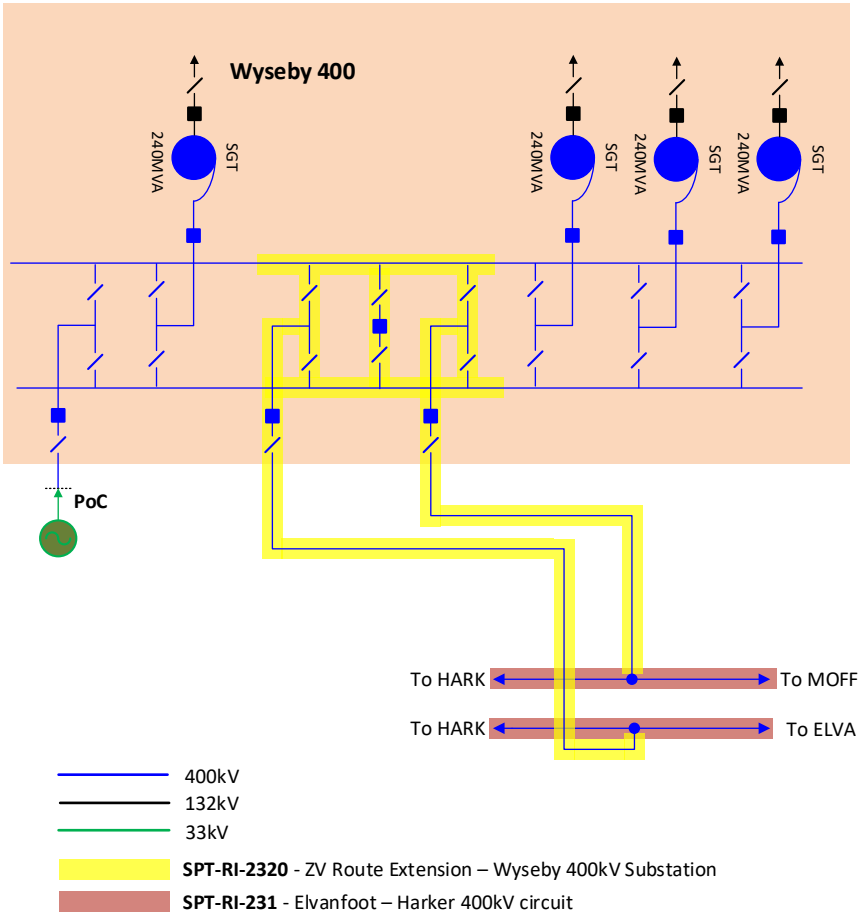

Figure 11: Initial Stage Development of Wyseby 400 kV Substation

The current contracted connections total 1.5GW at Wyseby 400kV Substation with active applications of 420MW.

Similarly to option 3, this option was discounted due to the infrequent infeed loss risk of 1800MW. Currently, it is at 1.5GW which is close to the limit (with a total including all active applications of 1960MW), however, with the inclusion of the contracted generation of SPT-RI-2876, this would be further exceeded.

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: Dumfries North 400kV Substation	Refer to Appendix A-1	Refer to Appendix A-3	Refer to Appendix A-4	Refer to Appendix A-5 & A-6	Early engagement with landowners and environmental bodies to secure necessary site permissions.	Necessary option to enable local generation works	N/A
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.
Rejected – Option 2: Extend/ Uprate Existing Dumfries North 132kV Substation	Refer to Appendix A-1	N/A	N/A	N/A	N/A	N/A	Does not satisfy requirements for enabling works
Rejected – Option 3: Utilise/Extend Existing Moffat 400 kV Substation	Refer to Appendix A-7	Refer to Appendix A-8	N/A	N/A	N/A	N/A	Not enough space to extend existing site. Breach of 1800MW limit for infrequent infeed loss risk.
Rejected – Option 4: Utilise/Extend Existing Wyseby Hill 400 kV Substation	Refer to Appendix A-9	Refer to Appendix A-10	N/A	N/A	N/A	N/A	Breach of 1800MW limit for infrequent infeed loss risk.

System Design Table	Circuit/Project	**Preferred – Option 1:** Dumfries North 400kV Substation	**Rejected – Baseline:** Do Nothing / Delay	**Rejected – Option 2:** Extend/ Uprate Existing Dumfries 132kV Substation	**Rejected – Option 3:** Utilise/Extend Existing Moffat 400 kV Substation	**Rejected – Option 4:** Utilise/Extend Existing Wyseby Hill 400 kV Substation
Thermal and Fault Design	Existing Voltage (if applicable)	N/A	N/A	132kV	400 kV	400 kV
	New Voltage	400kV	N/A	N/A	N/A	N/A
	Existing Continuous Rating (if applicable)	N/A	N/A	TBC	N/A	N/A
	New Continuous Rating	5000A	N/A	N/A	N/A	N/A
	Existing Fault Rating (if applicable)	N/A	N/A	TBC	N/A	N/A
	New Fault Rating	55kA	N/A	N/A	N/A	N/A
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A	N/A	N/A	N/A	N/A
	New MVAR Rating (if applicable)	N/A	N/A	N/A	N/A	N/A
	Existing GVA Rating (if applicable)	N/A	N/A	N/A	N/A	N/A
	New GVA Rating	N/A	N/A	N/A	N/A	N/A
System Requirements	Present Demand (if applicable)	N/A	N/A	N/A	N/A	N/A
	2050 Future Demand	N/A	N/A	N/A	N/A	N/A
	Present Generation (if applicable)	N/A	N/A	N/A	N/A	N/A
	Future Generation Count	5	5	5	5	5
	Future Generation Capacity	1041 MW	1041 MW	1041 MW	1041 MW	1041 MW
Initial Design Considerations	Limiting Factor	Land availability	N/A	Land availability	Land availability/Infrequent infeed loss risk	Infrequent infeed loss risk
	AIS/ GIS	TBC	N/A	N/A	N/A	N/A
	Busbar Design	Double busbar	N/A	N/A	N/A	N/A
	Cable/ OHL/ Mixed	N/A	N/A	N/A	N/A	N/A
	SI	Future layout to include additional 400kV bays for future connections, provision for additional	N/A	No scope for Strategic Investment	No scope for Strategic Investment	No scope for Strategic Investment

		400/132kV transformers, to facilitate future GSP and/or Network Rail connections and space for operability devices that will be confirmed with additional power system analysis.				

3.6. Selected Option

The most appropriate option to provide future connection capabilities and transmission reinforcement in the South-West is the establishment of a 400kV substation at north of Dumfries (Option 1).

The construction will consist of a new 400kV DBB with provision for up to 23 bays based on the following allowance;

- 2 bays for new double circuit OHL to Glenmuckloch
- 2 bays for new double circuit OHL to Wyseby/B6
- 2 bus sections
- 2 bus couplers
- 2 bays for new double circuit OHL to Craigenputtlock
- 1 bay for [redacted] SGT
- 1 bay for new OHL circuit to [redacted]
- 2 bays for a future GSP
- 2 bays for Network Rail
- 2 bays for 400 kV compensation
- 1 bay for a 400/132kV SGT
- 4 future bays

This option is currently technology agnostic with regards to the switchgear insulation type due to the currently unknown size of site and future technology capabilities/costs.

It is important to note this option has been chosen due to the wider implications surrounding the WCN2 scheme currently being planned for the South West of Scotland, enabling the connection of increased offshore generation to the grid while also providing a suitable path to the B6 boundary at the Scottish Border. The establishment of the Dumfries North 400kV substation allows for provision of a 400kV route along with other enabling works.

4. Proposed Works and Associated Costings

4.1. Project Summary

The selected option details the installation of a 400kV substation in Dumfries North with up to 23 bays. The project is due to be delivered in a safe and timely manner with provision for future projects to utilise the 400kV DBB.

4.2. Delivery

The Dumfries North 400kV substation is to be established to provide a connection point for planned connections such as SGTs and the future WCN2 400kV corridor. The single line diagram for these works is shown in Figure 12.

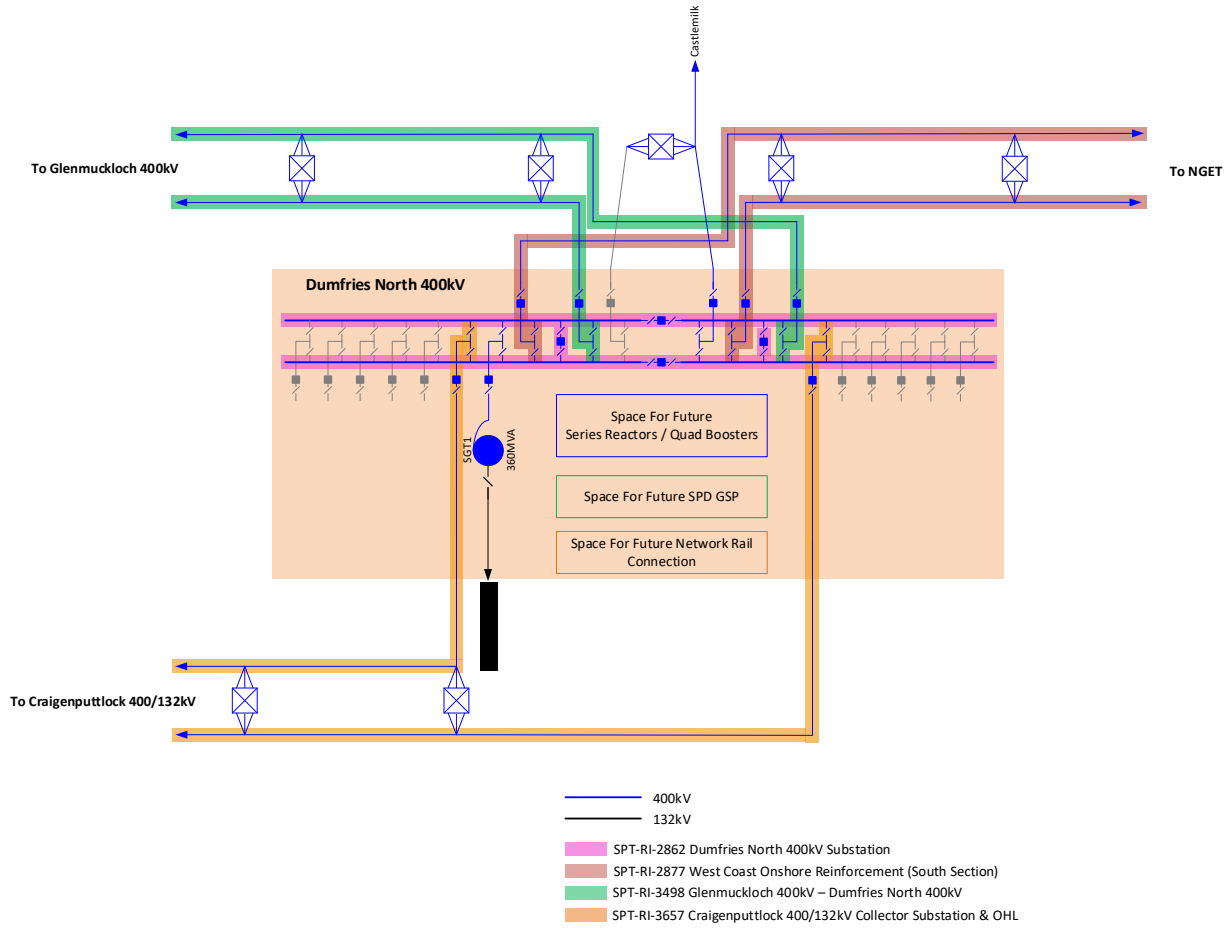

Figure 12: Indicative Works - Single Line Diagram (Note: Only SPT-RI-2862 is included in this scope of works)

The associated works for the delivery of this project are detailed below:

Pre-Engineering Works

The following list is indicative based on previous experience of such sites and as such should not be read as definitive. Seeking to drive efficiencies throughout the project, any surveys that have been undertaken for the site and are still suitable, will be reused. 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.

Dumfries North 400kV substation

The works at Dumfries North 400kV substation shall, as indicated in Figure 12, include:

Installing a new 400kV DBB with provision for up to 23 bays including space for;

- 2 bays for new double circuit OHL to Glenmuckloch
- 2 bays for new double circuit OHL to Wyseby/B6
- 2 bus sections
- 2 bus couplers
- 2 bays for new double circuit OHL to Craigenputtlock
- 1 bay for [redacted] SGT
- 1 bay for new OHL circuit to [redacted]
- 2 bays for a future GSP
- 2 bays for a future Network Rail connection
- 2 bays for 400 kV compensation
- 1 bay for a 400/132kV SGT
- 4 bays for future connections

4.3. Further Development at 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. 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.

It is proposed that this project will be integrated with the WCN2 project and a new 400kV corridor over the B6 border to increase the bulk power transfer though the system. As this power transfer increases, there will be a requirement to install additional equipment at key locations to ensure the system remains operable. Given this is a new site to be established, layouts will also consider the potential for the connection of this type of device. This will be determined through power system analysis, which will provide the optimal specification and location required.

4.4. Estimated Total Project Cost

A Business Plan provision and estimated cost of the project is indicated in the following table which includes only the works under SPT-RI-2862; the costs for elements related to Craigenputtlock (SPT-RI-3567), WCN2 (SPT-RI-2877 and SPT-RI-3498) and the respective connection infrastructure works are included in those schemes. Costs below are referred as "Direct", so neither risk contingency nor indirect have been included in the project cost. Project costs are summarised in the Cost Breakdown (Table 2) below:

Table 2: Project Cost Breakdown

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

Expenditure incidence is summarised below in Table 3:

Table 3: Summary of Expenditure Incidence

Energisation Year	Yr. 2027: Direct CAPEX	Yr. 2028: Direct CAPEX	Yr. 2029: Direct CAPEX	Yr. 2030: Direct CAPEX	Yr. 2031: Direct CAPEX	Yr. 2032: Direct CAPEX	Yr. 2033: Direct CAPEX	Yr. 2034: Direct CAPEX	Yr. 2035: Direct CAPEX	Yr. 2036: Direct CAPEX	Yr >2036: Direct CAPEX	Total: Direct CAPEX
2036	£0.002m	£0.02m	£0.34m	£0.76m	£1.05m	£0.83m	£0.18m	£3.85m	£10.71m	£18.29m	£6.51m	£42.54m

4.5. Regulatory Outputs

The indicative primary asset outputs are identified in Table 4 below:

Table 4: Indictive Primary Asset Outputs

Asset Category	Asset Sub-Category Primary	Voltage	Forecast Additions[8]	Forecast Disposal
Substation Platform	Platform Creation	400kV	TBC(m^2)	-
Circuit Breaker	CB	400kV	23 units	-
Wound Plant	Transformer	400kV < 500MVA	1 unit	-
Switchgear	Disconnector	400kV	23 units	-

5. Deliverability

We have applied SPT's 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.

5.1. 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. The GANTT chart below (Figure 13) summarises the key milestones within the delivery schedule for of this project.

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

ID	Task Name	Duration	Start	Finish
1	IP2 Approved	0 days	Mon 26/05/25	Mon 26/05/25
2	Early Contractor Involvement –QHL & Substation EPC Contractors Allocated	1000 days	Thu 01/06/28	Wed 31/03/32
3	Town and Country Planning Activities incl. Application Process	1040 days	Mon 30/10/28	Fri 22/10/32
4	Town and Country Planning Application Award Date	0 days	Fri 22/10/32	Fri 22/10/32
5	Award of Main Works EPC - Substation	0 days	Fri 22/10/32	Fri 22/10/32
6	Discharge of Planning and S37 Conditions	130 days	Mon 25/10/32	Fri 22/04/33
7	Site Set Up	20 days	Mon 02/05/33	Fri 27/05/33
8	Substation Site Wor	895 days	Mon 30/05/33	Fri 31/10/36
9	Commissioning	67 days	Thu 31/07/36	Fri 31/10/36
10	Site Operational	0 days	Fri 31/10/36	Fri 31/10/36

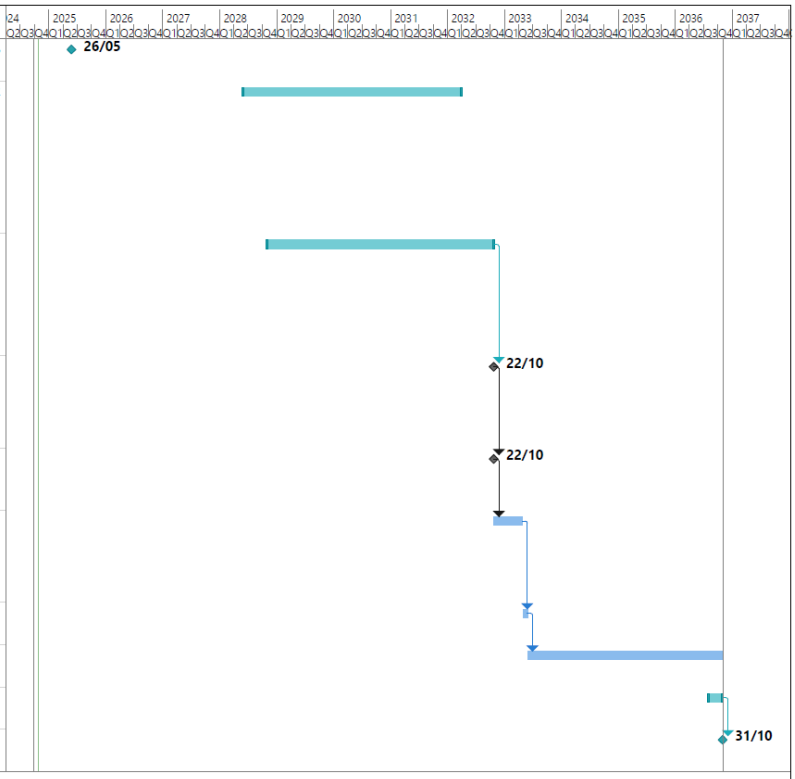

Figure 13: GANTT Chart of Project Progression and Associated Milestones

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.

5.2. 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 Dumfries North Substation. Poor ground conditions could have a great impact on the foundation/platform design which will impact cost and timeline of delivery.
- Design/Scope Uncertainty – The substation/project is still in a relatively early stage so is subject to design changes i.e. further contracted generation requiring additional bays. This is at risk if land access is not agreed as soon as possible and will impact cost and delivery timeline.
- Servitudes, Lease, Wayleaves – Discussions with the Landowner are yet to commence and may impact cost and timeline if not agreed.

- Servitudes, Lease, Wayleaves – Dependent upon the outcome of discussion with the Landowner, a compulsory purchase order may be required which will impact the timeline of the development of the WCN2 scheme.

5.3. Quality Management

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

5.3.1. Quality Requirements During Project Development

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

5.4. 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.

5.4.1. 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.

5.4.2. 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.

5.5. 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.

5.6. 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 below either threshold for early or late competition and therefore is not eligible.

7. Conclusions

This EJP establishes the requirement for a new 400kV substation at Dumfries North in order to enable the connection of 657 MW of SPEN best-view generation in the surrounding area.

The works at Dumfries integrate with the proposed 400kV double circuit corridor between the west of Scotland and the B6 boundary with NGET. This will allow for future transmission requirements to be satisfied in line with predicted FES requirements in the region.

In summary, the main conclusions of this submission are:

- The completion of works at the Dumfries North 400kV substation is essential to enable the connection of 657 MW of SPEN best-view connections in the local area and to ease constraints on the existing 132kV network at Dumfries.
- The development of the substation and surrounding 400kV transmission works is required to align with future needs in the South West region and to be co-ordinated with the WCN2 scheme
- The proposed 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.

8. Appendices

8.1. Appendix A: Maps and Diagrams

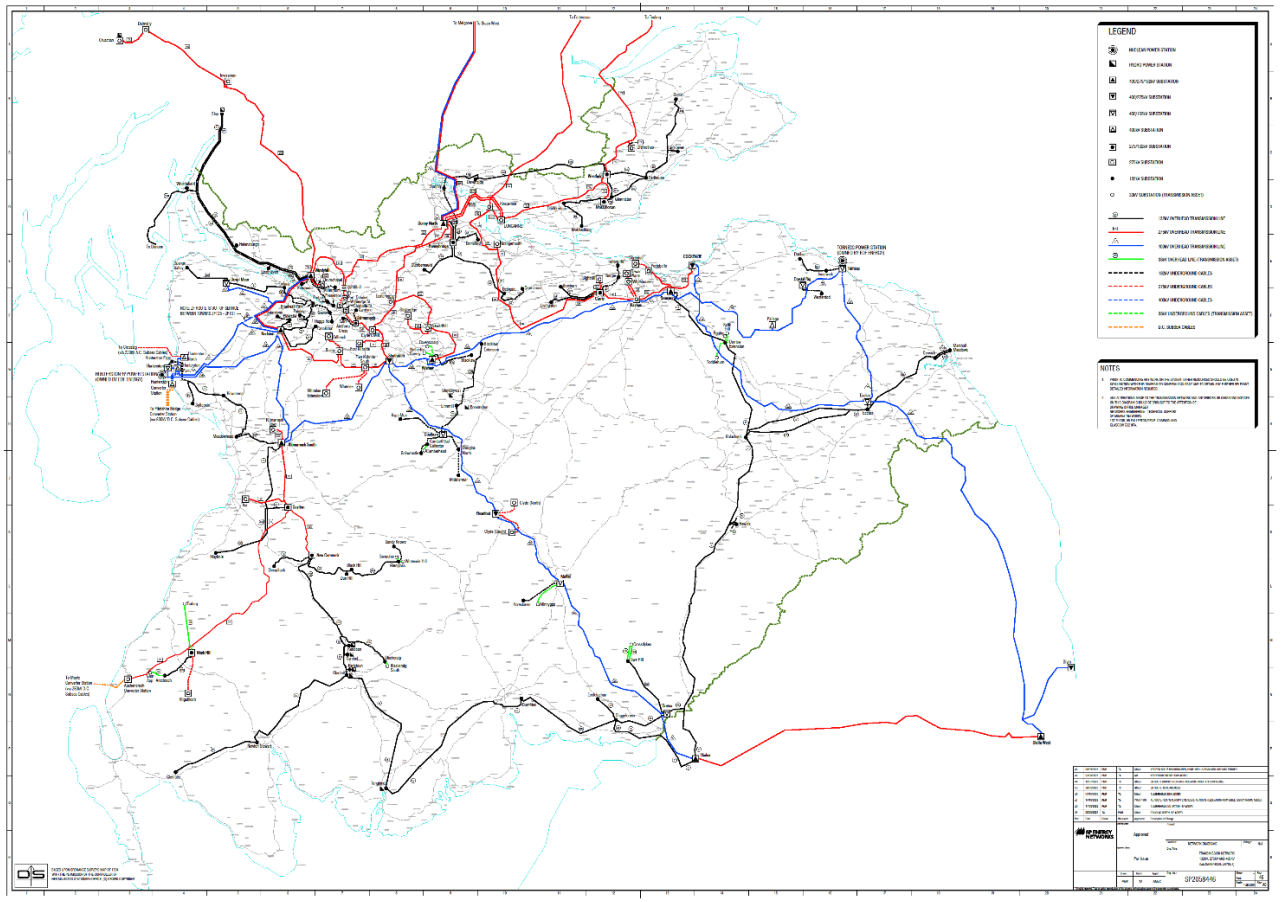

Figure A-1: Networks Diagram of the existing SPT system - Geographical Layout

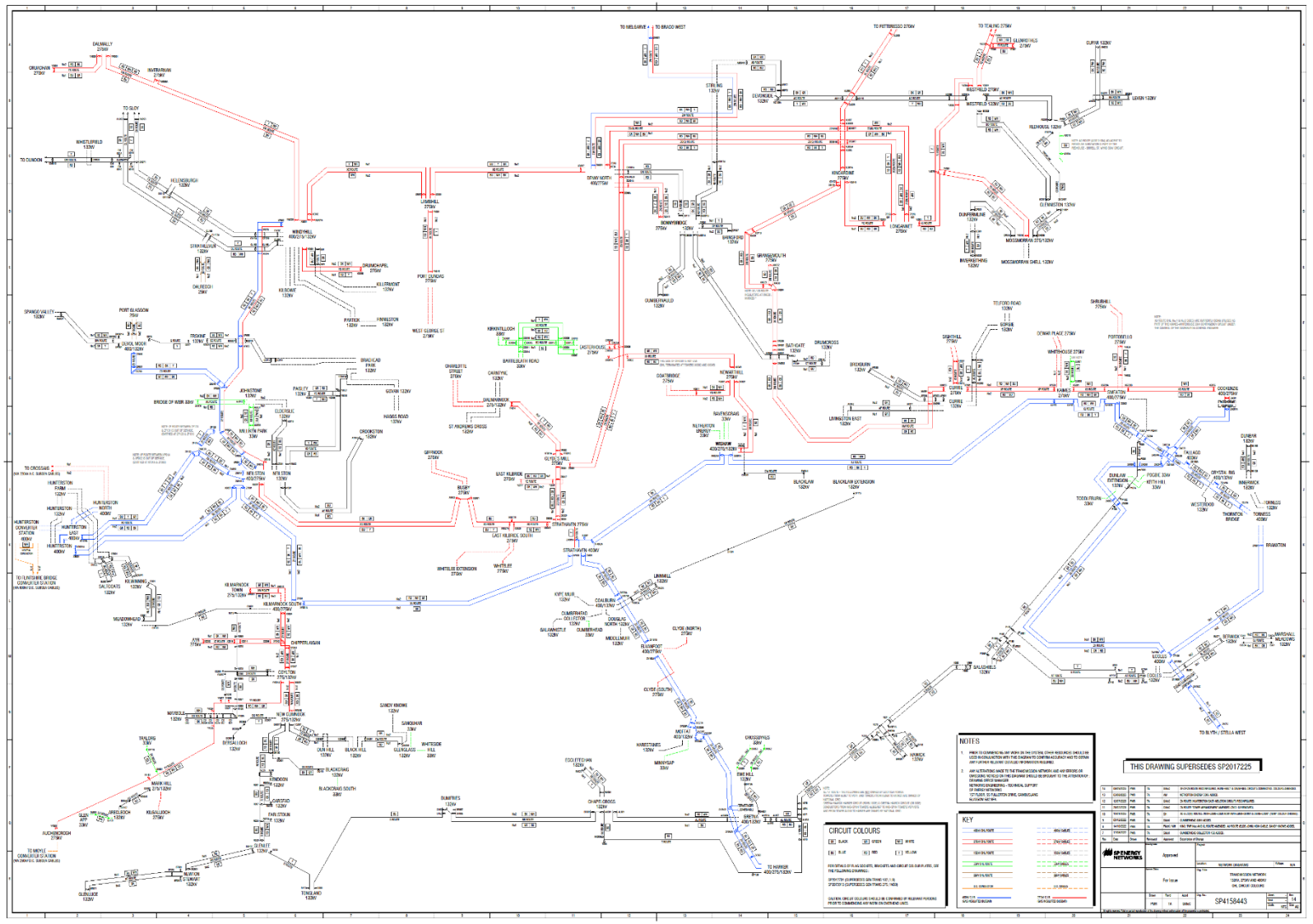

Figure A-2: Networks Diagram of the existing SPT system – Single Line Diagram

Figure A-3: Indicative Area of Proposed Dumfries North Site for further study – Geographical Site Layout

Figure A-4: Dumfries Region Geological Survey

Figure A-5: Moffat 400 kV Substation Geographical Map

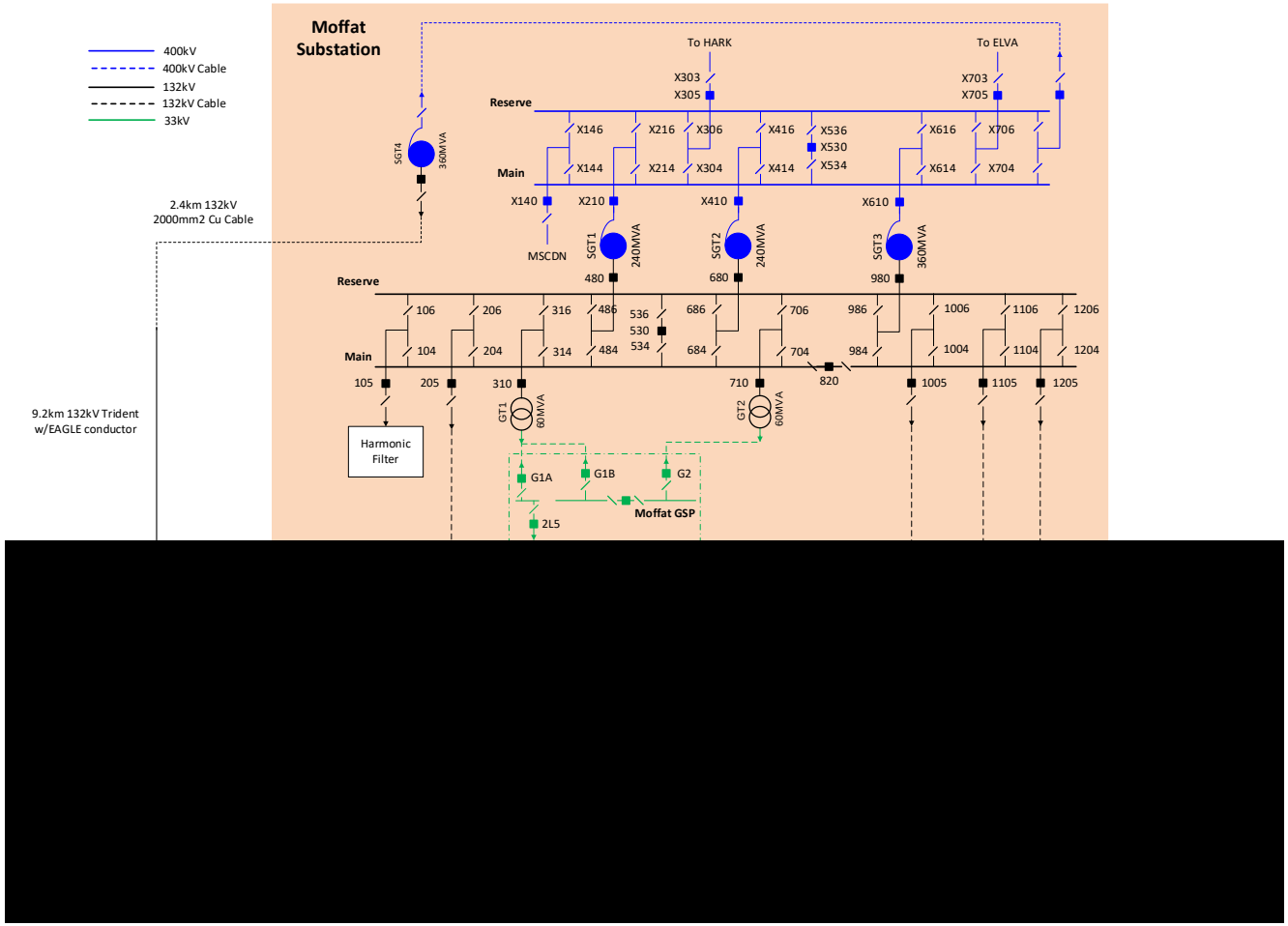

Figure A-6: Moffat 400 kV Substation Single Line Diagram

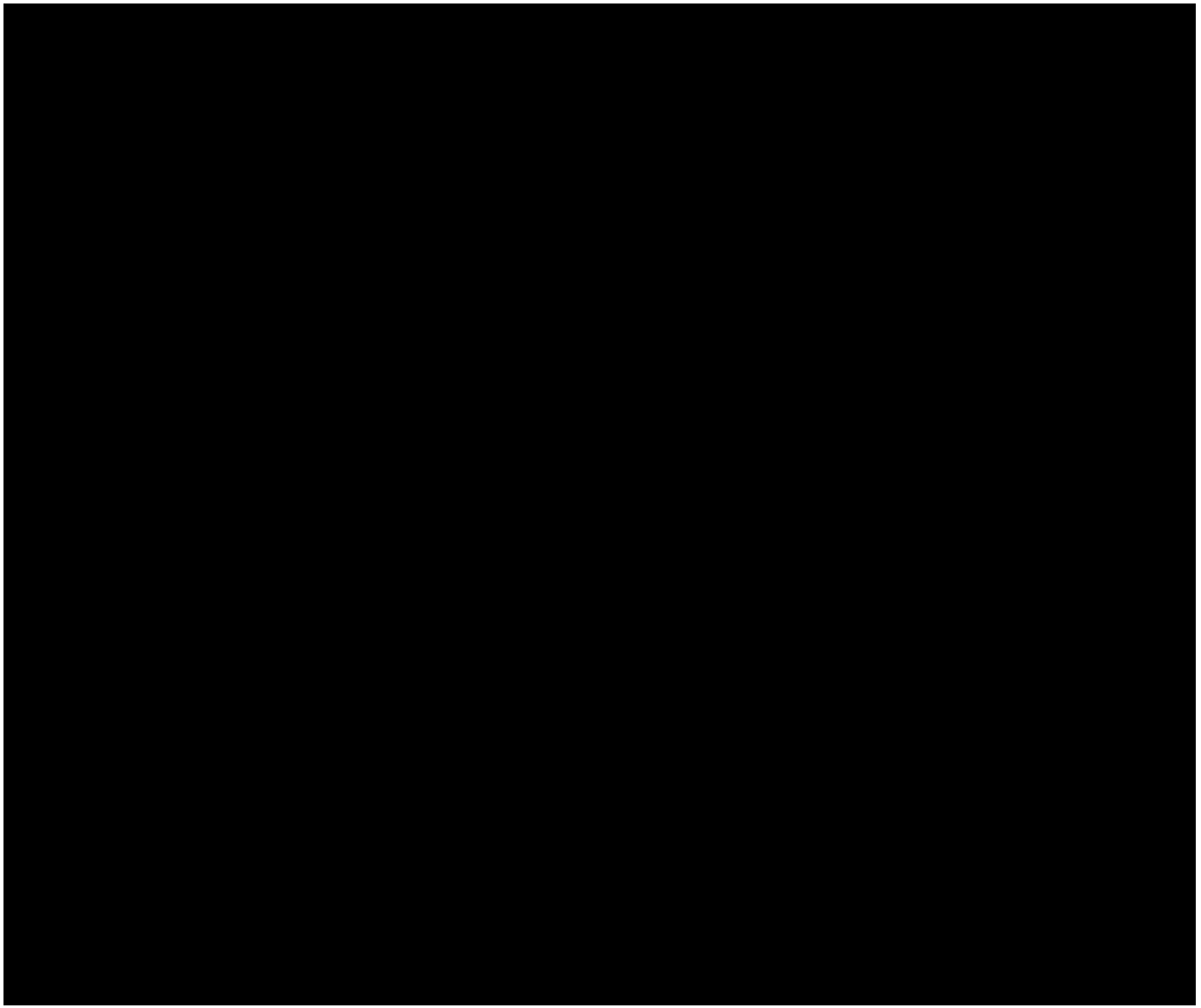

Figure A-9: Wyseby Hill 400 kV Substation Geographical Map

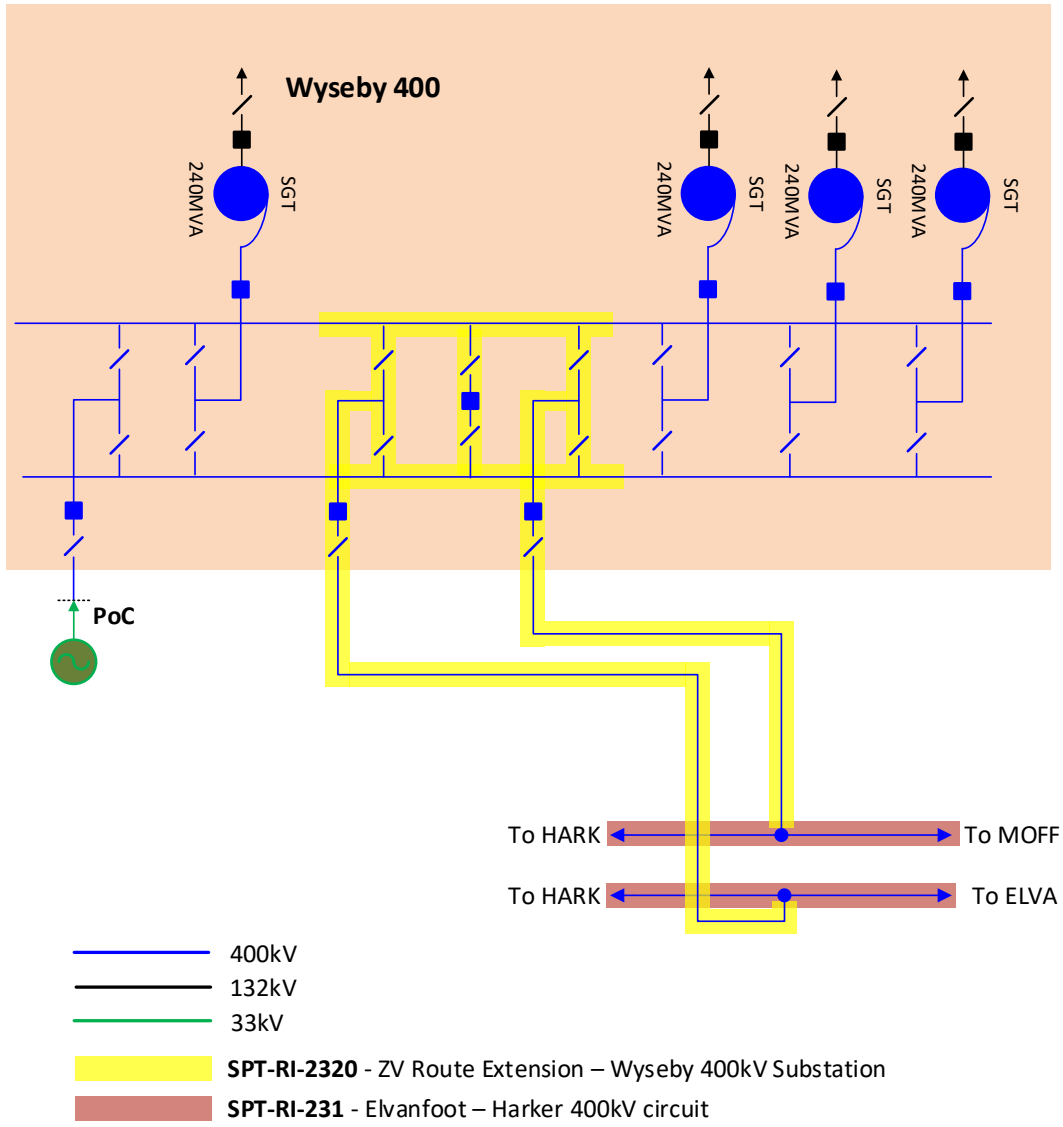

Figure A-10: Wyseby Hill 400 kV Substation Single Line Diagram

8.2. Appendix B: Organisational Diagrams

ID	Task Name	Duration	Start	Finish
1	IP2 Approved	0 days	Mon 26/05/25	Mon 26/05/25
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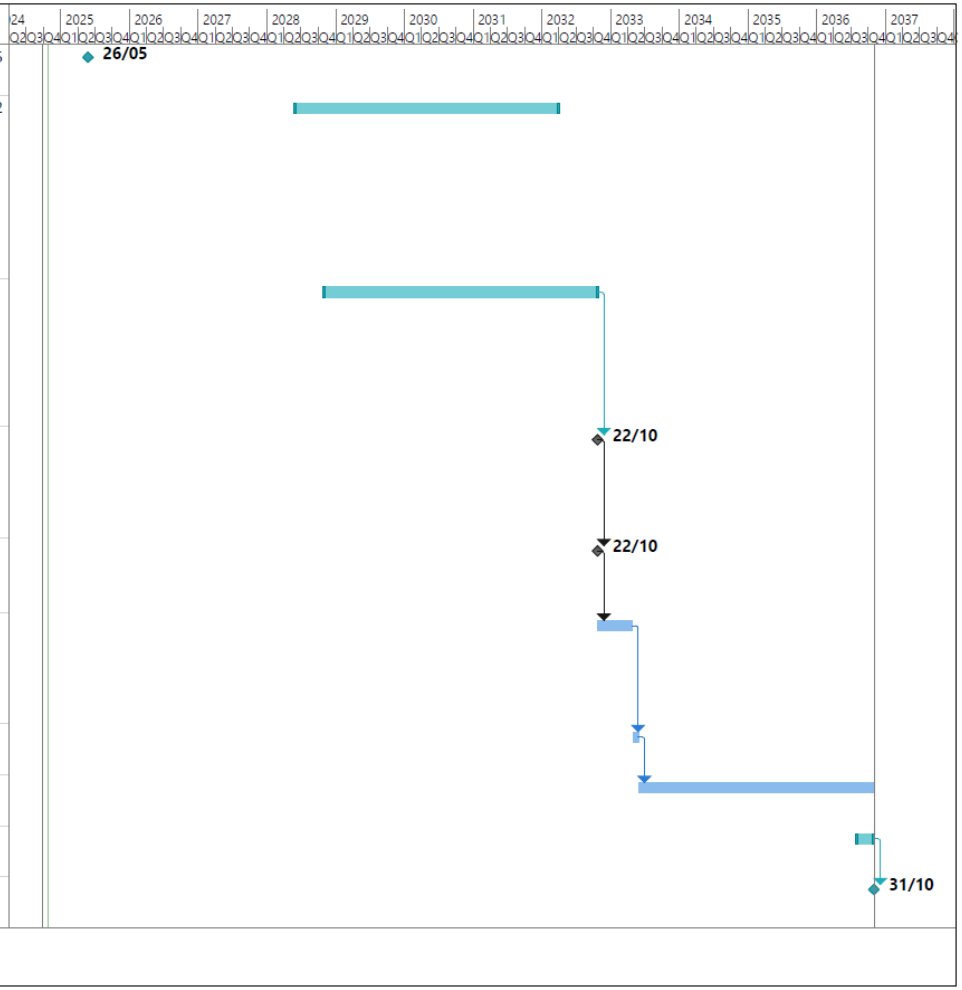

Figure B-1: GANTT Chart of Project Progress and Associated Milestones