Glenglass to Glenmuckloch 132kV OHL

Route Strategy EJP
Version: 1.0
11/12/2024

SP Energy Networks
RIIO-T3 Business Plan

SP Energy Networks

<table>
<tr><th colspan="5">GLENGLASS to GLENMUCKLOCH 132kV OHL</th></tr>
<tr><td>Name of Scheme</td><td colspan="4">SPT-RI 173 Glenglass to Glenmuckloch 132kV OHL</td></tr>
<tr><td>Investment Driver</td><td colspan="4">Local Enabling (Entry)</td></tr>
<tr><td>BPDT / Scheme Reference Number</td><td colspan="4">SPT200324</td></tr>
<tr><td>Outputs</td><td colspan="4">• 132kV CB (Gas Insulated Busbar) – 2 units
• 132kV CB (Air Insulated Busbar) – 4 units
• 132kV Platform Creation – 1 unit
• 132kV OHL (Tower Line) Conductor – 18.52km (2 x 9.26km)
• 132kV Tower – 41 units
• 132kV Fittings (Overhead Line Fittings) – 82 units</td></tr>
<tr><td>Cost</td><td colspan="4">£45.41m</td></tr>
<tr><td>Delivery Year</td><td colspan="4">2027</td></tr>
<tr><td>Applicable Reporting Tables</td><td colspan="4">BPDT (Section 5.1 - Project Meta Data, Section 6.1 - Scheme C&V Load Actuals, and Section 11.10 Contractor Indirects)</td></tr>
<tr><td>Historic Funding Interactions</td><td colspan="4">N/A</td></tr>
<tr><td>Interactive Projects</td><td colspan="4">N/A</td></tr>
<tr><td rowspan="2">Spend Apportionment</td><td>ET1</td><td>ET2</td><td>ET3</td><td>ET4</td></tr>
<tr><td>£0.47m</td><td>£12.34m</td><td>£32.60m</td><td>£0.00m</td></tr>
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Table of Contents

1. Executive Summary

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

- development of a new Glenmuckloch 132kV substation in south west Scotland (SWS) area of SP Transmission's (SPT) network;
- provision of two feeder bays for the new Glenmuckloch No.1 and No. 2 circuits at Glenglass 132kV substation; and
- construction of a new double circuit 132kV overhead line (OHL) between Glenglass and new Glenmuckloch 132kV substations.

There are multiple drivers behind this project (ref. SPT-RI-173) which entail:

- enabling connection of generation applications received in the area; and
- facilitating future extension of transmission network from Glenmuckloch substation to the existing 400kV ZV route (this work is planned under SPT-RI-236 and is outside the scope of this EJP).

The expected project delivery year for this scheme is 2027. The estimated project cost is £45.41m.

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.

2. Introduction

This EJP sets out the SPT's plans to carry out reinforcement work between Glenglass 132kV substation and a new Glenmuckloch 132kV substation.

These works, described in Transmission Owner Reinforcement Instruction SPT-RI-173, will extend the 132kV transmission network in SWS area from Glenglass 132kV substation to a new Glenmuckloch 132kV substation, enabling the connection of contracted renewable generation in the area.

The Glenglass 132kV substation forms part of the SPT network in south west Scotland, situated to the east of New Cumnock 275/132kV substation. A geographic overview of the existing SPT system is provided in Figure A-1, in Appendix A. Figure 1 shows an extract from this geographic overview, indicating existing transmission network connectivity in proximity to Glenglass 132kV substation and a representation of the proposed location for the Glenmuckloch 132kV substation that will be established as part of this project. The current schematic configuration of transmission network in the area is shown in Figure 2.

The proposed works comprise the following:

- Provision of two Gas Insulated Switchgear (GIS) feeder bays for the new Glenmuckloch No.1 and No.2 circuits at Glenglass 132kV substation;
- Construction of a new double circuit 132kV OHL, with approximate 9.3km route length, between Glenglass 132kV substation and Glenmuckloch 132kV substation; and

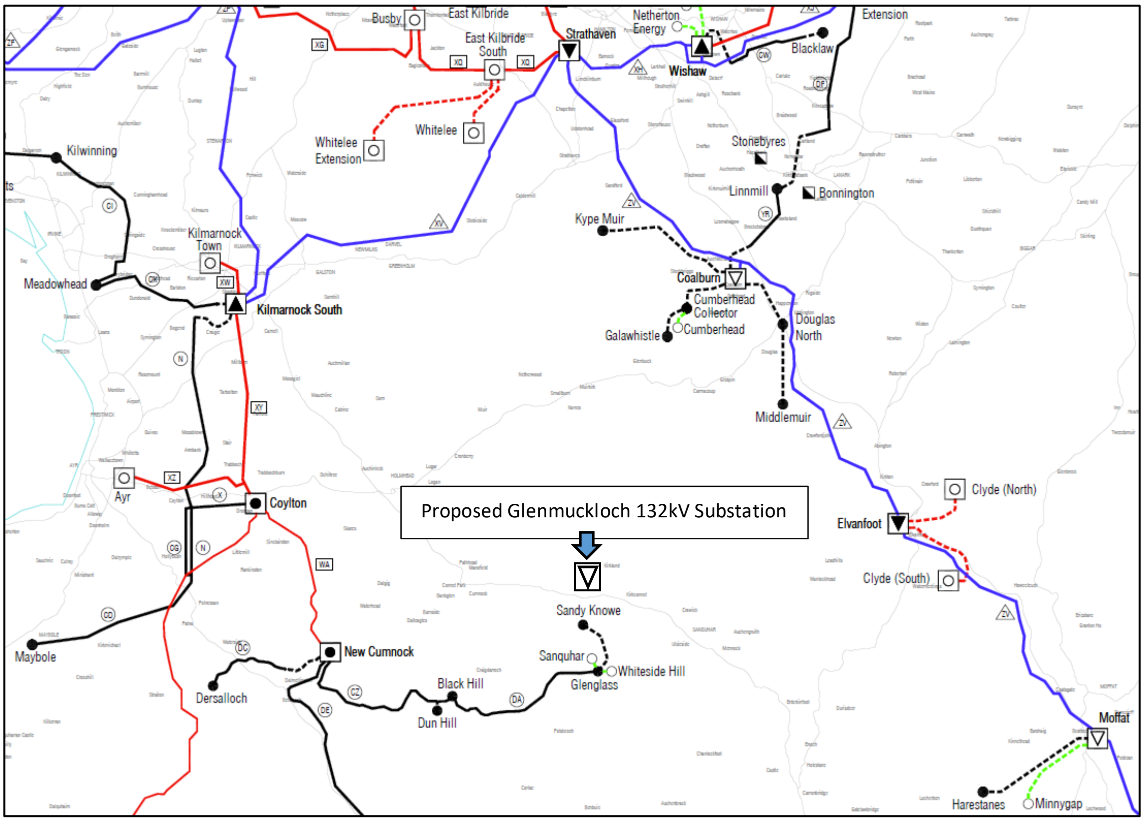

Figure 1: Geographic Indication of the Glenglass and Glenmuckloch 132kV Substations

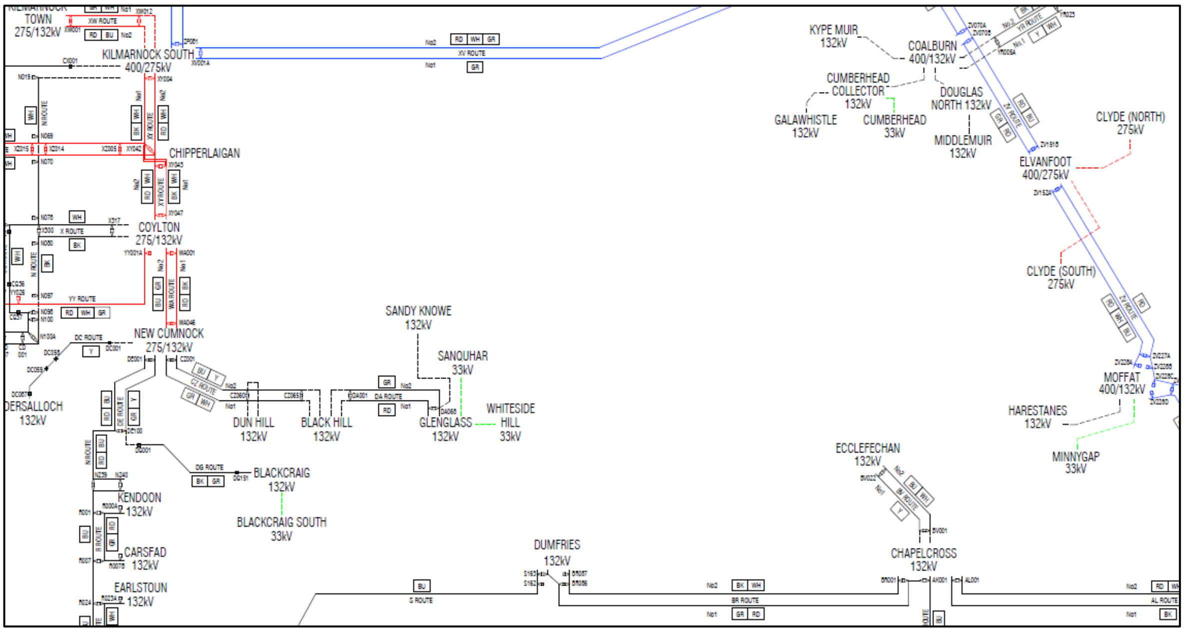

Figure 2: The existing transmission network in the area - extracted from Network Diagram of the Existing SPT Systems shown in Appendix A (Figure A-2).

- The establishment of a 132kV double-busbar Air Insulated Switchgear (AIS) substation at Glenmuckloch, to accommodate up to 11 bays initially and designed for the future establishment of a local 400kV substation.

The driver behind this scheme is enabling connection of the generation applications received into this part of the system. This project is Enabling Works required for connection of approximately 342MW contracted generation in the area. The proposed scheme will additionally facilitate creation of a new 'exit route' from Glenmuckloch area towards the existing ZV Route, which form parts of the SPT 400kV system, enabling the connection of a further circa 752MW of contracted generation. Creation of this new exit route is also contingent with development of Glenmuckloch to ZV 400kV OHL (ref. SPT-RI-236) and Redshaw 400/132kV substation (ref. SPT-RI-2060, SPT-RI-2061, SPT-RI-2139 & SPT-RI-3060). Redshaw substation will connect to the Strathaven – Harker 400kV (ZV) OHL route between Coalburn and Elvanfoot 400kV substations. Figure A-3, in Appendix A, depicts the single line diagram of the network in the area where these reinforcement projects have been highlighted. These schemes (i.e., SPT-RI-236, SPT-RI-2060, SPT-RI-2061, SPT-RI-2139 & SPT-RI-3060) are outside the scope of this EJP.

The expected project delivery date for the proposed reinforcement scheme is June 2027, with a total estimated cost of £45.41m.

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.

The Needs Case for SPT-RI-173 Glenglass to Glenmuckloch 132kV OHL and the factors that have an impact on the timing and scope of works are discussed in the following sections. Full justification for the preferred investment option is presented, together with a detailed description of the proposed solution.

3. Background Information

3.1. Key Project Drivers

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 wind, will play a vital role in reaching these legislated net zero targets.

Further commitments, by the UK Government in October 2021, to decarbonise the power system by 2035, 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[1], setting out its ambition to deploy 20GW of onshore wind capacity by 2030.

On 9th September 2021, the former Department for Business, Energy & Industrial Strategy (BEIS) announced a £265.00m[2] budget per year for the Contracts for Difference (CfD) Allocation Round 4, which launched on 13th December 2021 and concluded on 7th July 2022. For the first time since 2015, established technologies, including onshore wind, were able to bid.

Given lowering technology costs and a favourable subsidy regime, this will support a considerable number of onshore renewables projects to successfully transition from project inception and development through to energisation[3]. The results of the CfD Allocation Round 6 were announced on 3rd September 2024, with annual auction rounds expected.

3.2. SPT-RI-173 Glenglass to Glenmuckloch 132kV OHL - Background

A Bilateral Connection Agreement is in place between NESO and the developers of the generation projects detailed in Table 1. In each case, the SPT-RI-173 Glenglass to Glenmuckloch 132kV OHL project is identified as Enabling Works, either independently (ref. Table 1 Column 6), or in combination with SPT-RI-302 (Glenglass 132kV GIS Substation project), SPT-RI-236 and SPT-RI-2060(ref. Table 1 Column 7), corresponding to Transmission Owner Construction Agreements that are in place between NESO and SPT.

Table 1 - Contracted Generation Dependent Upon SPT-RI-173

Connecting Substation	Contracted Development	Consent Status	TECA Score[4]	Contracted Energisation Date	SPT-RI-173	SPT-RI-173, SPT-RI-236, SPT-RI-302 & SPT-RI-2060
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

1 [Onshore wind: policy statement 2022 - gov.scot (www.gov.scot)]
2 [Biggest ever renewable energy support scheme backed by additional £265 million - GOV.UK (www.gov.uk)]
3 [BEIS Electricity Generation Costs (2020) - GOV.UK (www.gov.uk)]
4 Transmission Economic Connections Assessment (TECA) – this assessment represents SPT's best view of the contracted generation landscape to 2036 and forms the basis for evaluating the timely delivery of reinforcement works. This regular assessment activity provides updated projections of

Connecting Substation	Contracted Development	Consent Status	TECA Score[4]	Contracted Energisation Date	SPT-RI-173	SPT-RI-173, SPT-RI-236, SPT-RI-302 & SPT-RI-2060
[redacted]						

renewable development in Scotland, and feeds into SPT's plans, ensuring the investment best meets the needs of users and customers.

5 Restricted Available Access (RAA) - when the transmission network is intact, network conditions may be such that the network becomes overloaded, requiring generation to be disconnected. Available on an interim basis only for developments with planning permission.

6 Non-Firm - for an intact transmission network, no overloading may occur and thus generation will not be disconnected. Following a single transmission circuit outage (planned or unplanned), generation will be disconnected if overloading of the transmission network results. This will be dependent upon the particular network conditions (e.g., maximum generation and minimum load).

Connecting Substation	Contracted Development	Consent Status	TECA Score[4]	Contracted Energisation Date	SPT-RI-173	SPT-RI-173, SPT-RI-236, SPT-RI-302 & SPT-RI-2060
[redacted]						
Total Capacity (MW)		-	-	-	**342MW**	**752MW**

* Connections to Glenglass and New Cumnock enabled by virtue of the commissioning of the Glenmuckloch to Redshaw connection offloading the New Cumnock 275/132kV Super Grid Transformers (SGT's).

TECA Legend

TECA Probability	Designated Colour
High	
Medium	
Low	

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

The system requirements and design parameters of the Glenglass to Glenmuckloch 132kV OHL reinforcements are summarised in Table 2.

Table 2 - System Requirements and Design Parameters of Glenglass to Glenmuckloch 132kV OHL

System Design Table	**Circuit/Project**	**Glenglass to Glenmuckloch 132kV OHL**
Thermal and Fault Design	Existing Voltage (if applicable)	N/A
	New Voltage	132kV
	Existing Continuous Rating (if applicable)	N/A
	New Continuous Rating	1740A (Summer Rating)
	Existing Fault Rating (if applicable)	N/A
	New Fault Rating	20/25kA
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A
	New MVAR Rating (if applicable)	
	Existing GVA Rating (if applicable)	
	New GVA Rating	
System Requirements	Present Demand (if applicable)	N/A
	2050 Future Demand	N/A
	Present Generation (if applicable)	N/A
	Future Generation Count	18
	Future Generation Capacity	1094MW
Initial Design Considerations	Limiting Factor	N/A
	AIS / GIS	AIS/GIS
	Busbar Design	Double Busbar
	Cable / OHL / Mixed	OHL
	SI	This scheme enables future development of network in the region.

4. Optioneering

The Glenglass to Glenmuckloch 132kV OHL project (SPT-RI-173) – as set out in this paper – enables the connection of consented renewable generation in the Glenmuckloch area, via the establishment of Glenmuckloch 132kV substation and its connection to Glenglass 132kV substation.

Various alternative options have been considered to accommodate the connection of proposed renewable generation developments in the Glenmuckloch/Sanquhar area.

The options assessed include a 'Do Nothing' option; connecting the planned Glenmuckloch 132kV substation to alternative existing substation sites; and a number of alternative options to establish the Glenmuckloch 132kV circuits.

4.1. Existing System Configuration at Glenglass 132kV Substation

The existing SPT 132kV network does not extend to the location of the new Glenmuckloch 132kV substation – as proposed to be established as part of the project set out in this EJP (SPT-RI-173).

Glenglass 132kV substation forms part of the southwest Scotland electricity transmission network and currently serves the Glenglass 33kV switchboard which provides connection to the SPT network for renewable generation sites in the nearby area.

Glenglass 132kV substation currently provides a connection to two incoming 132kV OHL circuits: Blackhill No. 1 132kV OHL and Blackhill No. 2 132kV OHL/Sandy Knowe 132kV cable. The site includes two 132/33kV, 90MVA transformers which provide two incoming 33kV circuits to the Glenglass 33kV GIS Switchboard.

Figure 3 shows a schematic diagram for the existing configuration at Glenglass 132kV substation. As detailed in Figure 3, Glenglass 132kV substation comprises the following:

- Blackhill No1 (132kV OHL circuit)
- Blackhill No2 (132kV OHL circuit) / Sandy Knowe (132kV 147MVA cable)
- T1 (132/33kV, 90 MVA, transformer)
- T2 (132/33kV, 90 MVA, transformer)
- Glenglass 33kV Switchboard

The connected and contracted generation position at Glenglass and Glenmuckloch 132kV substations, are detailed in Section 3.2 of this document.

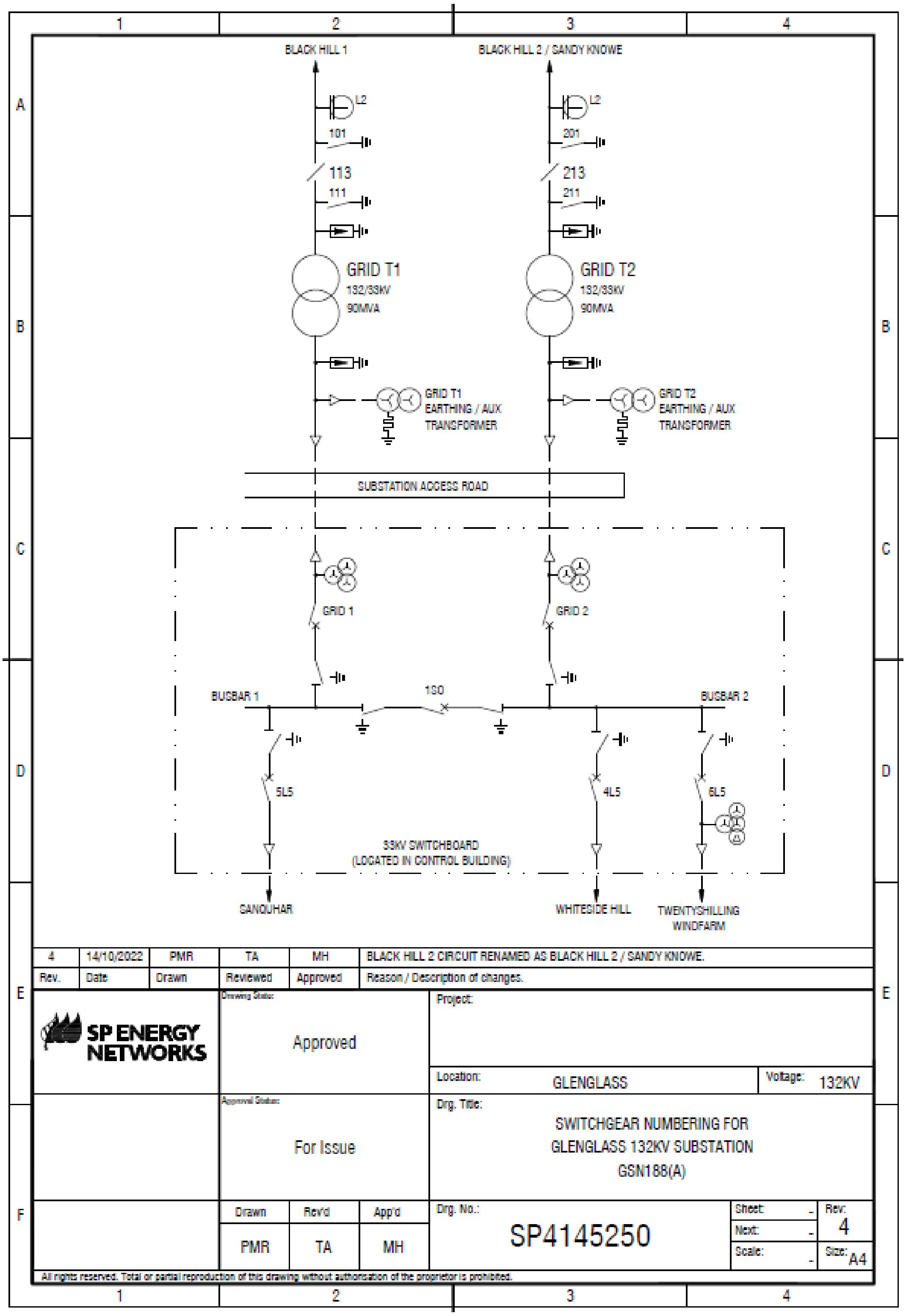

Figure 2 – Existing Configuration – Glenglass 132kV Substation

4.2. Planned System Configuration at Glenglass 132kV Substation

The MSIP[7] Stage 1 paper for the Glenglass 132kV substation project (SPT-RI-302) was submitted to Ofgem in January 2023. The scope of this project at that time involved the reinforcement of Glenglass 132kV substation with the installation of a 10-Bay, double-busbar, 132kV GIS switchboard at the site. Both the Needs Case and proposed works were supported by Ofgem in its provisional decision[8].

In the period since January 2023, Transmission Owner Construction Offers (TOCO) in respect of [redacted] have been accepted, the latter requiring the installation of one further bay of 132kV GIS switchgear.

The resulting 11 Bay, double busbar, 132kV GIS substation at Glenglass will consist of 8 feeder bays, 2 Transformer bays and a bus coupler bay. The circuits to be connected are as follows:

- Blackhill No. 1
- Blackhill No. 2
- Glenglass 132/33kV 90MVA T1
- Glenglass 132/33kV 90MVA T2
- Sandy Knowe Wind Farm
- [redacted] Wind Farm
- [redacted]
- [redacted] Farm
- Glenmuckloch No.1
- Glenmuckloch No.2

The scheme proposed in this EJP is contingent upon the completion of SPT-RI-302; the construction of the 132kV substation at Glenglass. Note that the Glenmuckloch No.1 and No.2 132kV GIS bays listed above will be funded by this project, SPT-RI-173. The works for SPT-RI-302 are outside the scope of this EJP.

A single line diagram of the planned Glenglass 132kV substation is provided in Figure 4.

7 Medium Sized Investment Projects - Link to SPT-RI-302 MSIP.
8 Link to Ofgem decision, published on 20 September 2023.

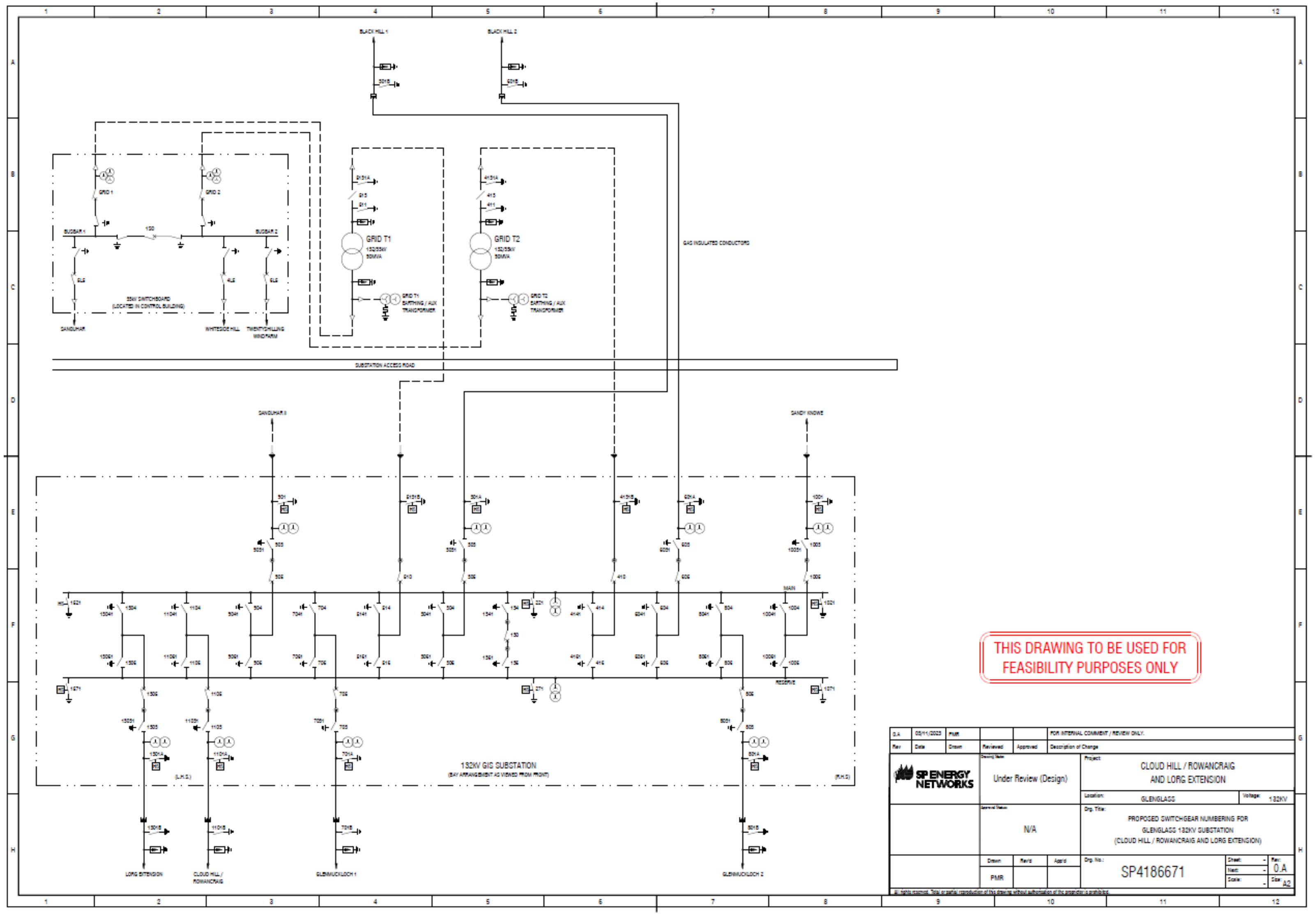

Figure 4: Planned Configuration – Glenglass 132kV Substation

4.3. Overview of Options

This section provides a description of each reinforcement option and details the key considerations. A summary of each option is described at the end of this section in Table 3, while the system requirements and design parameters for the considered options are outlined in Table 4.

4.3.1. Option 1 – Do Nothing or Defer

A ‘Do Nothing’ or ‘Defer’ option is not viable for this project and would be inconsistent with SPT statutory duties and licence obligations, including Licence Conditions D3 and D4A. These 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, in line with the System Operator Transmission Owner Code (STC) and the associated Construction Planning Assumptions provided by NESO. The proposed works are Enabling Works in the connection agreements relating to the projects in Table 1.

4.3.2. Option 2 – Glenglass to Glenmuckloch Connection

4.3.2.1. Option 2a - Glenglass to Glenmuckloch 132kV via OHL

This option requires the establishment of a new 132kV double circuit OHL, of L7 specification, between Glenmuckloch and Glenglass, which has an approximate route length of 9.3km. It involves the construction of an up to 11-bay double busbar 132kV AIS substation at Glenmuckloch and requires an extension of the Glenglass 132kV GIS substation by two feeder bays to accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV substation.

The Glenglass 132kV substation is being delivered as part of the scope of works for SPT-RI-302. The design of the 132kV GIS building at Glenglass has been developed with the provision of space within the building to accommodate the two additional 132kV feeder bays to connect to the Glenmuckloch 132kV OHL circuits as well as space for four future bays to accommodate further connections into Glenglass substation. Two of the four future bays are presently contracted as part of the [redacted] developments.

4.3.2.2. Option 2b – Glenglass to Glenmuckloch 132kV via Underground Cable

An alternative method of achieving a 132kV double circuit connection between the Glenglass and Glenmuckloch 132kV substations would be via underground cable (UGC).

As part of the development of SPT-RI-173, SPT engaged a specialist external consultancy to lead a process of identifying and selecting a cable route option and assessing the constructability of the route taking account of engineering considerations. Multiple cable routes have been assessed, with the preferred route being approximately 12.26km in length.

The works to connect the double circuit at both the Glenglass and Glenmuckloch substations would be largely unchanged from the option outlined above in Section 4.3.2.1; however, considering the required length of cable, there would be requirement for reactive compensation equipment (i.e., shunt reactor and harmonic filter) to be installed at both the substations to ensure maximised power flow in the UGC and network’s compliance with EREC G5/5 requirement[9] as the result of project

[9] As part of a regulated business, SP Energy networks (SPEN) evaluates compliance of the connection applications with respect to industry standards including compliance with ENA Engineering Recommendation (EREC) G5/5 for harmonic voltage levels.

development. The additional required equipment would result in a significant increase in the overall size of substation footprint.

Considering the cost for purchasing the required length of cable, harmonic filter and reactive compensation equipment, the estimated cost for this option is approximately £143.51m.

In addition to the increased cost, maintenance, and inspection of UGCs is significantly more challenging than that of overhead infrastructure. Although minor faults on cables are less common than on OHLs when cable faults do happen detecting fault and restoring the power in them will require extensive works and result in major disruption. The UGCs might visually be less intrusive in comparison to the OHLs; however, they may not represent the best interest of the landowners (i.e., project stakeholders) due to the greater footprint and associated impact on the agricultural and forestry lands in the area. Installing 132kV UGCs requires excavating wide and deep trenches to ensure safety and security of the cable. Additionally, a significant number of overground infrastructure, in the form of manholes and link pillars, need to be constructed to connect sections of cable and allow for any future maintenance access. These will have a permanent impact on the landscape and usability of the ground surrounding the trenches and manholes.

The installation of sections of underground cable within a project must balance economic, technical, and environmental considerations. With underground cable, the incremental cost is a significant consideration.

4.3.3. Option 3 – New Cumnock to Glenmuckloch 132kV OHL

This option requires the establishment of a new 132kV double circuit OHL, of L7 specification, between Glenmuckloch and New Cumnock. Similar to Option 2a, this option also involves the construction of an up to 11 bay, double busbar 132kV AIS substation at Glenmuckloch. Option 3 would also necessitate an extension of the New Cumnock 132kV AIS substation by two feeder bays, to accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV substation.

This option was considered, however discounted in advance of a detailed cost estimating exercise for the following reasons: -

- The distance between the proposed Glenmuckloch substation and the existing New Cumnock substation is approximately 20km in a straight line. At a high level, given the route length, an estimated 132kV OHL purchase cost is approximately £40.66m, without considering the additional cost for the installation and substation works. Additionally, it can be expected that any proposed route would be at least 10-20% greater than the straight-line distance, resulting in an increased cost.
- The development of the Glenmuckloch 132kV substation is cost neutral in comparison to the other options. Unchanged from Option 2a these works are approximately £20.96m greater than Option 2a.
- To accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV substation, construction of two new feeder bays at the existing New Cumnock 132kV substation, where space is already limited, is required which would add further cost to this option.

Considering these, the costs associated with this option would be significantly more expensive when compared to Option 2a.

4.3.4. Option 4 – Coylton to Glenmuckloch 132kV OHL

This option requires the establishment of a new 132kV double circuit OHL, of L7 specification, between Glenmuckloch and Coylton. Similar to Option 2a, this option involves the construction of an up to 11 bay, double busbar 132kV AIS substation at Glenmuckloch. Option 4 would also necessitate an extension of the Coylton 132kV AIS substation by two feeder bays, as a minimum, to accommodate the connection of the incoming 132kV OHL double circuit from the future Glenmuckloch 132kV substation.

This option was considered but discounted in advance of a detailed cost estimating exercise for the following reasons: -

- The distance between the proposed Glenmuckloch substation and the existing Coylton substation is approximately 25km in a straight line. At a high level, given the route length, an estimated 132kV OHL purchase cost is approximately £42.51m, without considering the additional cost for the installation and substation works. Additionally, it can be expected that any proposed route would be at least 10-20% greater than the straight-line distance, resulting to an increased cost.
- The development of the Glenmuckloch 132kV Substation is cost neutral in comparison to the other options. Unchanged from Option 2a these works are approximately £20.96m more expensive than Option 2a.
- To accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV substation, construction of two new feeder bays at the existing Coylton 132kV substation is required which would add further cost to this option.

Considering these the cost associated to this option would be significantly more expensive when compared to Option 2a.

4.3.5. Option 5 – Blackhill to Glenmuckloch 132kV OHL

This option requires the establishment of a new 132kV double circuit OHL, of L7 specification, between Glenmuckloch and Blackhill. Similar to Option 2a, this option involves the construction of an up to 11 bay, double busbar 132kV AIS substation at Glenmuckloch. Option 5 would also necessitate an extension of the Blackhill 132kV GIS substation by two feeder bays, to accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV Substation.

This option was considered, however discounted in advance of a detailed cost estimating exercise for the following reasons: -

- The distance between the proposed Glenmuckloch substation and the existing Blackhill substation is approximately 14km in a straight line. At a high level, given the route length, an estimated 132kV OHL purchase cost is approximately £28.34m, without considering the additional cost for the installation and substation works. Additionally, it can be expected that any proposed route would be at least 10-20% greater than the straight-line distance, resulting to an increased cost.
- The development of the Glenmuckloch 132kV Substation is cost neutral in comparison to the other options. Unchanged from Option 2a these works are approximately £20.96m more expensive than Option 2a.
- To accommodate the connection of the incoming 132kV OHL double circuit from Glenmuckloch 132kV substation, construction of two GIS feeder bays at the existing Blackhill 132kV substation is required. These two feeder bays would need to be adjacent to each

other at one end of the switchboard. There is space within the existing Blackhill 132kV GIS building for two additional GIS feeder bays; however, these are not adjacent to each other. Facilitating this option will require re-arrangement of the existing 132kV GIS switchboard, which is very complex and costly. It will also require long outages, affecting system access for generation developments whose connection depends on the proposed reinforcement scheme (i.e., as listed in Table 1). Additionally, the entry to these bays would need to be made via 132kV cable, which would increase cost and complexity of the option.

Considering these, Option 5 does not provide an economic solution when compared to Option 2a.

4.3.6. Option 6 – Glenglass 275kV to Glenmuckloch 275kV

This option requires the establishment of a 275kV network from Glenglass to the planned Glenmuckloch substation.

In this option, there will be more transmission equipment required to step up the voltage from 132kV to 275kV level on the route between the planned Glenglass 132kV to the Glenmuckloch substation as well as more switchgear and land. Developing 275kV infrastructure in this part of the network also limits further development of the wider system in the region with respect to the need to enable a connection to the contracted Redshaw 400/132kV substation on the ZV route. As outlined in Section 2, these works are planned under SPT-RI-236 and SPT-RI-2060, which are outside the scope of this EJP. This option would also require a larger substation footprint at Redshaw to accommodate all the associated equipment for 400kV, 275kV and 132kV voltage levels.

Considering these reasons, this option does not represent the most economic and efficient system; hence, is discounted in advance of detailed cost estimating exercise.

4.4. Selected Option – Glenglass to Glenmuckloch 132kV OHL (Option 2a)

The most appropriate option to enable the economic, efficient, and co-ordinated connection of the proposed renewable generation developments in the Glenmuckloch/ Sanquhar area is to extend the Glenglass 132kV network to the planned Glenmuckloch substation (i.e., Option 2a).

Upon completion of the planned SPT-RI-236 Glenmuckloch to Redshaw and SPT-RI-2060 Redshaw 400kV Substation works (outside the scope of this EJP), the SPT-RI-173 Glenglass to Glenmuckloch 132kV OHL works will continue to be required in order to support the connection of further renewable generation in southwest Scotland e.g. at New Cumnock 132kV Substation and Glenglass 132kV Substation, as indicated in Table 1.

4.5. Whole System Outcomes

Our optioneering approach has identified ‘Whole System’ interactions with other electricity network in the area, i.e., SP Distribution (SPD), in the development of our proposed solution and has considered the appropriate ‘Whole System’ outcome. This is with consideration that it is not expected that there is any future requirement for SP Distribution (SPD) connections at this location, as the DNO in the area.

Table 3 - Summary of Considered Options

Options	Map	Layout of Substation/ Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Risks	Narrative Preferred Option	Narrative Rejection
Preferred – Option 2a: Glenglass to Glenmuckloch 132kV via OHL	Refer to Figure 5	N/A	N/A	N/A	Early engagement with landowners, environmental bodies and employing low bearing pressure ground vehicles and trackway where possible to minimise extents of stone tracks.	Seven options have been reviewed in terms of scope feasibility, cost, delivery timescales, land requirements, system limitations and restoring SQSS compliant limit. Option 2a demonstrates a wider network capacity reinforcement while presenting the least risk to project deliverability.	N/A
Rejected – Option 1: Do Nothing / Defer	N/A	N/A	N/A	N/A	N/A	N/A	Inconsistent with SPT's various statutory duties and licence obligations.
Rejected – Option 2b: Glenglass to Glenmuckloch 132kV via underground cable	N/A	N/A	N/A	N/A	N/A	N/A	The installation of sections of underground cable within a project must balance economic, technical, and environmental considerations. This option was discounted as the incremental cost of utilising underground cable for the proposed scheme in comparison with the OHL is significant.
Rejected – Option 3: New Cumnock to Glenmuckloch 132kV OHL	N/A	N/A	N/A	N/A	N/A	N/A	This option requires establishment of a new 132kV OHL double circuit with route length of approximately 20km, resulting in a higher cost than the preferred option. This option will not be the most economic and efficient system; hence, is discounted in advance of detailed cost estimating exercise.

Options	Map	Layout of Substation/ Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Risks	Narrative Preferred Option	Narrative Rejection
Rejected – Option 4: Coylton to Glenmuckloch 132kV OHL	N/A	N/A	N/A	N/A	N/A	N/A	This option requires establishment of a new 132kV OHL double circuit with route length of approximately 25km, resulting in a higher cost than the preferred option. This option will not be the most economic and efficient system; hence, is discounted in advance of detailed cost estimating exercise.
Rejected – Option 5: Blackhill to Glenmuckloch 132kV OHL	N/A	N/A	N/A	N/A	N/A	N/A	This option requires establishment of a new 132kV OHL double circuit with route length of approximately 14km, resulting in a higher cost than the preferred option. This option will not be the most economic and efficient system; hence, is discounted in advance of detailed cost estimating exercise.
Rejected – Option 6: Glenglass 275kV to Glenmuckloch 275kV	N/A	N/A	N/A	N/A	N/A	N/A	This option requires more transmission equipment at the planned Glenglass 132kV substation to step up the voltage to 275kV as well as more switchgear and land. This option does not provide an efficient system; hence, was discounted in advance of detailed cost estimating exercise.

Table 4 – System Requirements and Design Parameters for the considered options

System Design Table	**Circuit/Project**	**Preferred – Option 2a:** Glenglass to Glenmuckloch 132kV via OHL	**Rejected – Option 1:** Do Nothing / Defer	**Rejected – Option 2b:** Glenglass to Glenmuckloch 132kV via Cable	**Rejected – Option 3:** New Cumnock to Glenmuckloch 132kV OHL
Thermal and Fault Design	Existing Voltage (if applicable)	N/A	N/A	N/A	N/A
	New Voltage	132kV	N/A	132kV	132kV
	Existing Continuous Rating (if applicable)	N/A	N/A	N/A	N/A
	New Continuous Rating	1740A (Summer Rating)	N/A	1740A (Summer Rating)	1740A (Summer Rating)
	Existing Fault Rating (if applicable)	N/A	N/A	N/A	N/A
	New Fault Rating	20/25kA	N/A	20/25kA	20/25kA
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A	N/A	N/A	N/A
	New MVAR Rating (if applicable)	N/A	N/A	N/A	N/A
	Existing GVA Rating (if applicable)	N/A	N/A	N/A	N/A
	New GVA Rating	N/A	N/A	N/A	N/A
System Requirements	Present Demand (if applicable)	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	18	18	18	18
	Future Generation Capacity	1094MW	1094MW	1094MW	1094MW
Initial Design Considerations	Limiting Factor	N/A	N/A	It does not enable the most economic and efficient electricity system in the area.	It does not enable the most economic and efficient electricity system in the area.
	AIS/ GIS	AIS/GIS	N/A	AIS/GIS	AIS
	Busbar Design	Double busbar	N/A	Double busbar	Double busbar
	Cable/ OHL/ Mixed	OHL	N/A	Underground Cable	OHL
	SI	This scheme enables future development of network in the region.	N/A	This scheme enables future development of network in the region.	This scheme enables future development of network in the region.

System Design Table	Circuit/Project	**Rejected – Option 4:** Coylton to Glenmuckloch 132kV OHL	**Rejected – Option 5:** Blackhill to Glenmuckloch 132kV OHL	**Rejected – Option 6:** Glenglass 275kV to Glenmuckloch 275kV
Thermal and Fault Design	Existing Voltage (if applicable)	N/A	N/A	N/A
	New Voltage	132kV	132kV	275kV
	Existing Continuous Rating (if applicable)	N/A	N/A	N/A
	New Continuous Rating	1740A (Summer Rating)	1740A (Summer Rating)	3590A (Summer Rating)
	Existing Fault Rating (if applicable)	N/A	N/A	N/A
	New Fault Rating	20/25kA	20/25kA	40/40kA
ESO Dispatchable Services	Existing MVAR Rating (if applicable)	N/A	N/A	N/A
	New MVAR Rating (if applicable)	N/A	N/A	N/A
	Existing GVA Rating (if applicable)	N/A	N/A	N/A
	New GVA Rating	N/A	N/A	N/A
System Requirements	Present Demand (if applicable)	N/A	N/A	N/A
	2050 Future Demand	N/A	N/A	N/A
	Present Generation (if applicable)	N/A	N/A	N/A
	Future Generation Count	18	18	18
	Future Generation Capacity	1094MW	1094MW	1094MW
Initial Design Considerations	Limiting Factor	It does not enable the most economic and efficient electricity system in the area.	It does not enable the most economic and efficient electricity system in the area.	It does not enable the most economic and efficient electricity system in the area.
	AIS/ GIS	AIS	GIS/AIS	AIS/GIS
	Busbar Design	Double Busbar	Double Busbar	Double Busbar
	Cable/ OHL/ Mixed	OHL	OHL	OHL
	SI	This scheme enables future development of network in the region.	This scheme enables future development of network in the region.	No development of 400kV substation reduces strategic investments.

5. Proposed Works & Associated Cost

5.1. Project Summary

The most appropriate option to enable the economic, efficient, and co-ordinated connection of proposed renewable generation developments in the Glenmuckloch/ Sanquhar area is to establish a new Glenmuckloch 132kV substation and an approximate 9.3km 132kV OHL from Glenmuckloch to Glenglass 132kV substation.

The associated works are summarised in the following sections (a) to (d).

a) Pre-Engineering Works

The following list is indicative based on previous experience of such sites and as such should not be read as definitive.

Any surveys that have previously been undertaken for the site, and are still suitable, will be reused in order to deliver project efficiencies.

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.
- Define final tower positions for Glenglass to Glenmuckloch circuits.
- Transport Survey to assess the access of the new Equipment.
- Environmental Study.

b) Glenglass 132kV Substation

Glenglass 132kV substation will be delivered as part of the SPT-RI-302 project (i.e., Glenglass 132kV substation project), as described in 6.2. At Glenglass 132kV substation there will be a requirement for 2 x 132kV GIS feeder bays to be installed to connect the No.1 and No.2 incoming circuits from Glenmuckloch 132kV Substation. The works at Glenglass are summarised as follows:

- Extend the GIS substation to install two feeder bays for the two 132kV circuits to Glenmuckloch substation.
- Connect the Glenmuckloch No.1 and No.2 circuits to the new 132kV bays.
- All control and protection works.
- All environmental and civil works.

The proposed configuration of Glenglass 132kV substation is shown in Figure 4.

c) Glenmuckloch 132kV substation

Glenmuckloch 132kV substation will be of an outdoor AIS design. The primary civil engineering works associated with this element of the project will comprise:

- The design and construction of the site civil platform in the substation area and in the area of the Glenglass overhead line entry;
- The design and construction of foundations and structures necessary to support the equipment within the areas above; and
- Enabling works to achieve the above e.g. works to facilitate temporary and/or enduring accesses for construction, operation and maintenance purposes.

The Glenmuckloch 132kV substation will be sized to accommodate up to 11 bays as part of its initial construction under SPT-RI-173 and shall be capable of being extended by at least a further three bays as required under SPT-RI-236.

Glenmuckloch 132kV AIS substation will be configured to ensure adequate capacity to accommodate future upgrades as per SPT-RI-236, which is expected to involve Glenmuckloch 132kV substation incorporating up to four 360MVA 400/132kV Super Grid Transformers (SGT).

Glenmuckloch 132kV substation shall be configured initially as follows, and shall be funded via SPT-RI-173 unless otherwise indicated below:

- [redacted] No.1 (funded via [redacted]
- Bus Coupler
- Future SGT ('Skeleton Bay' comprising busbar disconnectors to minimise future outage needs)
- [redacted] No.2 (funded via [redacted]
- [redacted] (funded via [redacted])
- Future SGT ('Skeleton Bay' comprising busbar disconnectors to minimise future outage needs)
- Glenglass No.1
- Space to allow for future Bus Section(s) to be installed
- Glenglass No.2
- Future SGT ('Skeleton Bay' comprising busbar disconnectors to minimise future outage needs)
- [redacted] (funded via [redacted]

The site shall be designed to be capable of further expansion as part of SPT-RI-236 in order to accommodate the following additional bays:

- Second Bus Coupler
- Additional SGT Bay

The site shall also be designed for the future establishment of a local 400kV substation.

The works at Glenmuckloch 132kV substation shall include the termination of the two 132kV circuits from Glenglass together with all control and protection work and all associated environmental and civil works.

The proposed initial development and configuration of Glenmuckloch 132kV substation is shown in Figure 5.

d) Glenglass to Glenmuckloch 132kV OHL

A 132kV OHL double circuit will be established between two new GIS feeder bays at Glenglass 132kV GIS substation and two new AIS feeder bays at the future Glenmuckloch 132kV AIS substation.

The proposed route for this OHL circuit is approximately 9.3km in length and will be constructed using new 132kV L7c tower and a twin UPAS double circuit arrangement. This 132kV OHL circuit is required to provide a summer rating of 398MVA. The overhead line works are summarised as follows:

- Establish a 132kV L7 double circuit OHL between Glenglass and Glenmuckloch 132kV substations, circa 9.3km.
- String each circuit with twin UPAS conductor operating at 90^{O}C.

The rating of the proposed conductor is set out in Table 5.

Table 5 – Rating of Twin UPAS Conductor at 132kV and Operating at 90^{O}C

Season / State	Amps	MVA
Winter Pre Fault	1950	446
Winter Post Fault	2320	530
Spring/Autumn Pre Fault	1870	428
Spring/Autumn Post Fault	2220	510
Summer Pre Fault	1740	398
Summer Post Fault	2080	474

The proposed 132kV OHL route from Glenmuckloch 132kV substation to Glenglass 132kV substation is indicated in Appendix A, Figure A-4.

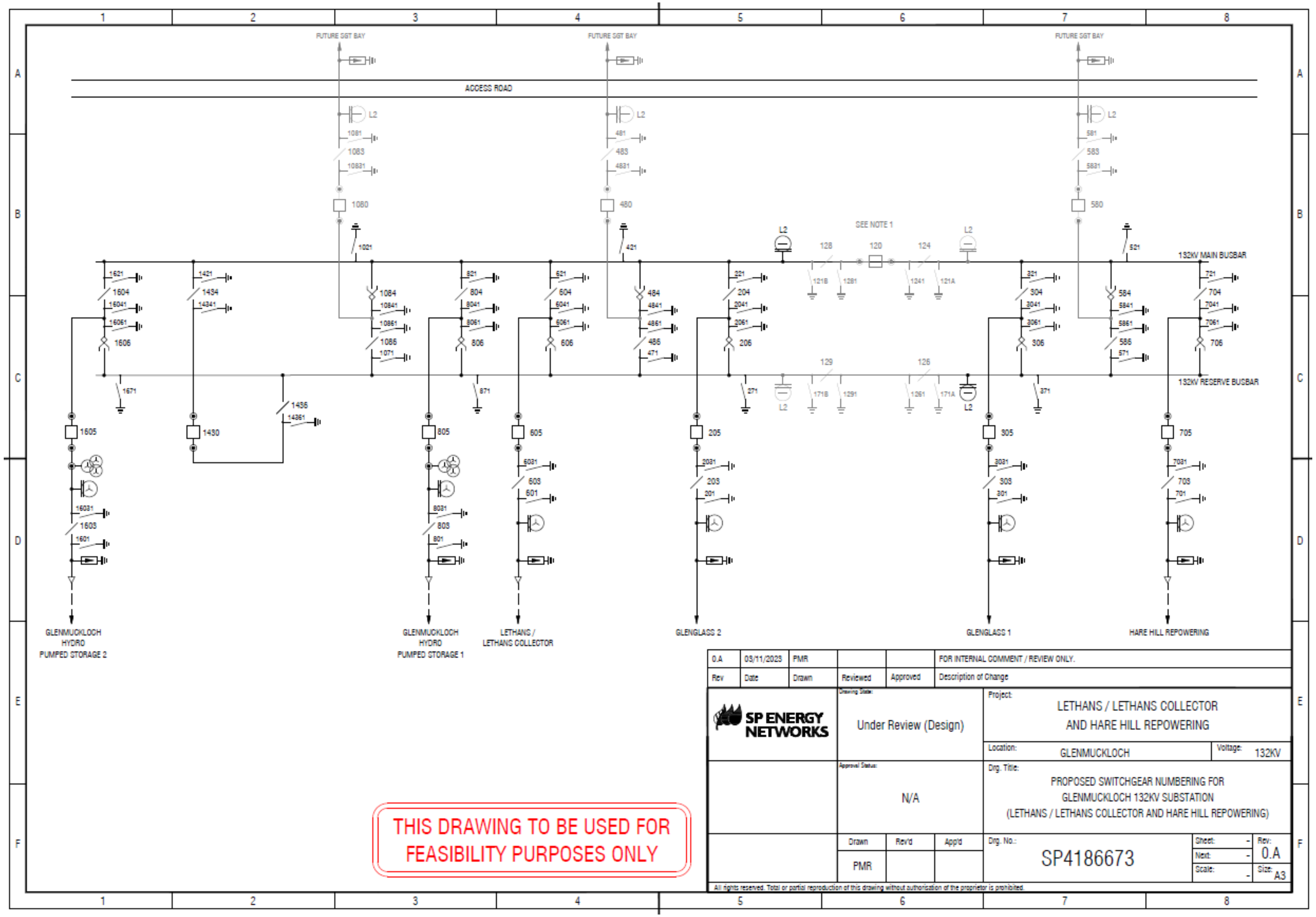

Figure 5: Proposed Configuration – Glenmuckloch 132kV Substation

5.2. Environmental and Consents Works

Section 37 consent is being sought from the Scottish Ministers to install and keep installed the new double circuit 132kV steel lattice tower OHL. Deemed planning permission is also being sought for the 132kV OHL and the proposed Glenmuckloch substation, as well as the ancillary development. Relevant landowner agreements will also need to be put in place where required.

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

The EIA Report details the findings of the assessment of the likely significant effects of the proposals on the environmental in terms of its construction and operation. The assessment forms part of the wider process of EIA, which is undertaken to ensure that the likely significant effects, both positive and negative of certain types of development are considered in full by the decision maker prior to the determination of an application for Section 37 consent and for deemed planning permission.

The main strategy for minimising adverse environmental effects of the proposals will be through careful OHL routeing. While some environmental effects can be avoided through careful routeing, other effects are best mitigated through local deviations of the route, the refining of tower locations and appropriate construction practices. Additionally, in certain cases, specific additional mitigation measures will be required, and these have been identified through the EIA process.

Consultation has taken place with Statutory stakeholders including SEPA and Nature Scot in relation to the proposals. Consultation was also undertaken with all other relevant stakeholders including the wider public and landowners.

6. Estimated Total Project Cost

A Business Plan provision and estimated cost of the project is indicated in Table 6. Costs provided include direct, indirect and risk contingency costs.

Table 6 – Project cost estimate breakdown

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

Expenditure incidence is summarised in Table 7.

Table 7 – Summary of expenditure incidence (£m)

Energisation Year	RIIO-T1 Total: CAPEX	Yr. 2022: CAPEX	Yr. 2023: CAPEX	Yr. 2024: CAPEX	Yr. 2025: CAPEX	Yr. 2026: CAPEX	Yr. 2027: CAPEX	Yr. 2028: CAPEX	RIIO-T2 Total: CAPEX	RIIO-T3 Total: CAPEX	Total: CAPEX
2027	0.47	0.47	0.43	1.72	3.33	9.61	5.38	2.83	12.34	32.60	45.41

6.1. Regulatory Outputs

The indicative primary asset outputs are identified in Table 8.

Table 8 – Indicative Primary Asset Outputs

Asset Category	Asset Sub-Category Primary	Voltage	Forecast Additions[10]	Forecast Disposals
Circuit Breaker	CB (Gas Insulated Busbar) (ID)	132kV	2 units	-
Circuit Breaker	CB (Air Insulated Busbar) (OD)	132kV	3 units	-
Substation Platform	Platform Creation	132kV	1 unit	-
Overhead Tower Line	OHL (Tower Line) Conductor	132kV	18.6km (2 x 9.3km)	-
Overhead Tower Line	Tower	132kV	41 units	-
Overhead Line Fittings	Fittings	132kV	82 units	

7. 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 work closely with our supply chain partners and this relationship is critical to the successful delivery of our plans. Our supply chain provides the support and agility to respond to changes in workload over the course of a price review. Further information is contained within our Workforce & Supply Chain Resilience Annex. 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. The project manager responsibilities, albeit not limited, include:

- Handing over the project from development phase to delivery phase and ensuring minimum requirements of the SPT project handover are met.
- System and customer updates to reflect transfer of ownership.
- Leading tender activities during development phase.
- Provision of a comprehensive resource plan to encompass all contractor and SPT operational activities.
- Booking outages and risks of trip with operational planning.
- Ensure all offline works are completed prior to any outage being taken to reduce system risk.
- Co-ordinate all site commissioning issues.
- Chair commissioning panel meetings.
- Chair progress meetings.
- Maintain the site quality plan.

10 Note: Forecast Additions are indicative pending further detail design.

Some further responsibilities of the project manager are discussed in the following sub-sections.

7.1. Delivery Schedule

A standard approach has been applied to the planning phase of this project and that will continue for the reporting and the application of processes and controls throughout the project lifecycle. Table 9 summarises the key project milestones within the delivery schedule. Complete detail on the energisation dates and delivery schedules for the proposed scheme can be found in Appendix B.

Table 9 – Summary of Key Milestones within the Project Delivery Schedule

Milestone	Project Phase	Estimated Completion Date
1	Conclude Missives on Glenmuckloch s/s	Dec 2024
2	Issue of ITT - Earthworks	July 2025
3	Tree Felling Contract Award	August 2025
4	OHL Site works Commencement	September 2025
5	Civils ITT	October 2025
6	Substation site Set up	March 2026
7	Award of Civil Works Contract	June 2026
8	Access Installation Works - OHL	November 2026
9	BOP ITT	August 2026
10	Award BOP Contract	February 2027
11	OHL Commissioning	June 2027
12	Commissioning	June 2027

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

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

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

Regular meetings with the project and construction management Teams will be undertaken to assess the ongoing effectiveness of the project management interfaces.

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

7.2. Alignment with Other Projects

The delivery of this SPT-RI-173 Glenglass to Glenmuckloch 132kV OHL project will be co-ordinated with the delivery of SPT-RI-302 at Glenglass 132kV substation, as well as the works associated with the various generation developments detailed in table 1.

7.3. Risk and Mitigation

A Project Risk Register has been developed collaboratively during the project kick-off meeting to identify any risks to the delivery plan. Mitigation strategies have 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 by the project team on an ongoing basis. The top project risks as currently identified are as follows:

Table 10 - Main Scheme Risks and Mitigation Plans

Risk Title	Risk Description	Mitigation Plan
Compulsory Purchase Order (CPO)	CPO being sought due to being unable to secure voluntary land rights for 132kV OHL circuit route.	Regular meetings will be held with SPEN's planning and permission team to ensure SPEN's OHL route principles have been met.

7.4. 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. The key quality management areas are detailed below:

7.4.1. Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product is 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.

7.5. 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.

7.5.1. Monitoring and Measuring During Project Delivery

SPT Projects undertake regular inspections on projects to monitor and measure compliance with SPT Environmental, Quality and Health and Safety requirements, as detailed in the contract specifications for the work. This also includes oversight of contractors. 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 set to ensure compliance with the following:

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

7.5.2. 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.

7.6. Environmental Sustainability

IMS-01-001 encompasses all activities undertaken within and in support of SP Energy Networks three Licences. This includes operational and business support functions concerned with management of SP Transmission, SP Distribution and associated regulatory and commercial interfaces, products, services, and their associated environmental, social and economic impacts. The policy makes the following commitments which shall be respected in any works associated with this scheme.

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

- Ensure the reliability and availability of our Transmission and Distribution network whilst creating value and delivering competitiveness by increasing efficiency and minimising losses.

- Reduce greenhouse gas emissions in line with our Net Zero Science Based GHG target, which is a target of 90% reduction in GHG emissions by 2035 (TBC) from a 2018/19 baseline.

- Integrate climate change adaptation requirements into our asset management and operations processes to support business resilience and reduce the length and time of service interruptions.

- Consider whole life cycle impacts to reduce our use of resources to sustainable levels, improve the efficiency of our use of energy and water and aim for zero waste.

- Improve land, air and watercourse quality by preventing pollution and contamination and protecting and enhancing biodiversity in our network areas.

- Improve our service to local communities, supporting their economic and social development, protecting vulnerable customers, and respecting human rights.

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

The proposed design solution is also resilient to future climate change risks, such as substation flooding or potential faults from vegetation along the route.

SPEN policy to eliminate risk of substation flooding entails:

- Substations shall be designed such that there is no loss of supply or damage to strategic equipment during a 0.1% annual exceedance probability (AEP) flood event. Access routes to the substation shall also be considered to ensure access will be available during flood conditions and consideration of staff access to the key plant and buildings during the 0.1% annual flood event.
- In those instances where there is a compelling reason to locate a substation inside this zone and this is accepted by SPEN Network Planning & Regulation the substation design shall eliminate or mitigate against the risk of such a flood impacting the operation of the substation (access requirements, loss of supply, or damage to equipment).
- The 400kV substation platforms shall be constructed at a minimum level of 600mm above the 0.1% designed flood level, the 600mm freeboard allows for uncertainties in data and modelling. The designed flood level shall include an allowance for climate change for a 50-year design life, in accordance with the requirements of the relevant national environment agency. Where climate change guidance is not available then a minimum of 200mm shall be applied. The flood design should consider Pluvial, Fluvial, Coastal and Reservoir flooding, as well as combinations of these.

SUB-01-018 gives detailed specific guidance on SPEN's substation flood resilience policy.

Also, SPEN policy to reduce the number of vegetation related OHL faults entails:

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

- Falling distance plus 5m (i.e., Vicinity Zone) to the conductor and maintain 5 years clear from that distance.
- Clearance as 5.3m to be achieved from conductor positioned at 45° blowout and maximum sag condition. Maintain 5 years clear from that distance.

- All vegetation directly below the OHL with the potential to breach the Vicinity Zone before the next cut cycle shall be removed.
- Hedgerows shall be maintained. Species identified with no threat to breach the Vicinity Zone at any point in the future shall continue to be managed as part of the 3-year vegetation management programme.
- Tower bases shall be kept free of all scrub to a distance of 5m from the base.

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

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

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

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

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

7.7. Stakeholder Engagement

SPT is committed to delivering optimal solutions in all the projects it undertakes. A key part of this is engaging with relevant stakeholders throughout the project development and delivery process. SPT's stakeholder engagement plan for this reinforcement project will be closely aligned to our wider stakeholder engagement commitments as outlined in our RIIO-T3 business plan. Stakeholders includes 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 has engaged with statutory consultees associated with the planning application for these works - the Local Authority, SEPA and Nature Scot - and the third-party landowner Forestry Land Scotland. Multiple public consultations have been carried out with other stakeholders, including community councils and local residents. A consultation feedback report will accompany the planning application. All documents relating to the planning application can be found at: Glenmuckloch to Glenglass Reinforcement Project - SP Energy Networks.

Due to the location and nature of this project, no sensitivities or community impact issues have been identified, but a general level of interest from local representatives has been noted and we will continue to engage with them throughout the project.

8. Conclusion

This EJP demonstrates the need to establish Glenmuckloch 132kV substation, with works commencing in the RIIO-T2 period (April 2021 – March 2026) and completing in the RIIO-T3 period. This project will enable the timely and efficient connection of up to 342MW of contracted onshore generation, comprising the consented [redacted] and [redacted] scheme.

As well as enabling the connection of the 342MW of consented generation noted above, these works will also facilitate the future extension of the transmission network from Glenmuckloch to the planned Redshaw 400kV substation (ref. SPT-RI-236), enabling the connection of a further 650MW of contracted renewable generation capacity in southwest Scotland.

The main conclusions of this EJP are as follows:

- The timely connection of low carbon generation, including onshore wind, will play a vital role in reaching legislated net zero targets, and is aligned with SPT's RIIO-T2 strategic goals.
- It is necessary to invest in transmission infrastructure at Glenmuckloch 132kV substation, and between Glenmuckloch 132kV and Glenglass 132kV substations, to facilitate the connection of 342MW of contracted onshore generation, this having been identified as the most economic and efficient option.
- 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. A cost assessment submission will be made to Ofgem via the Load Related Reopener at an appropriate time within the RIIO-T3 period.

9. Appendices

Appendix A – Maps and Diagrams

[redacted]

Appendix A: Maps and Diagrams

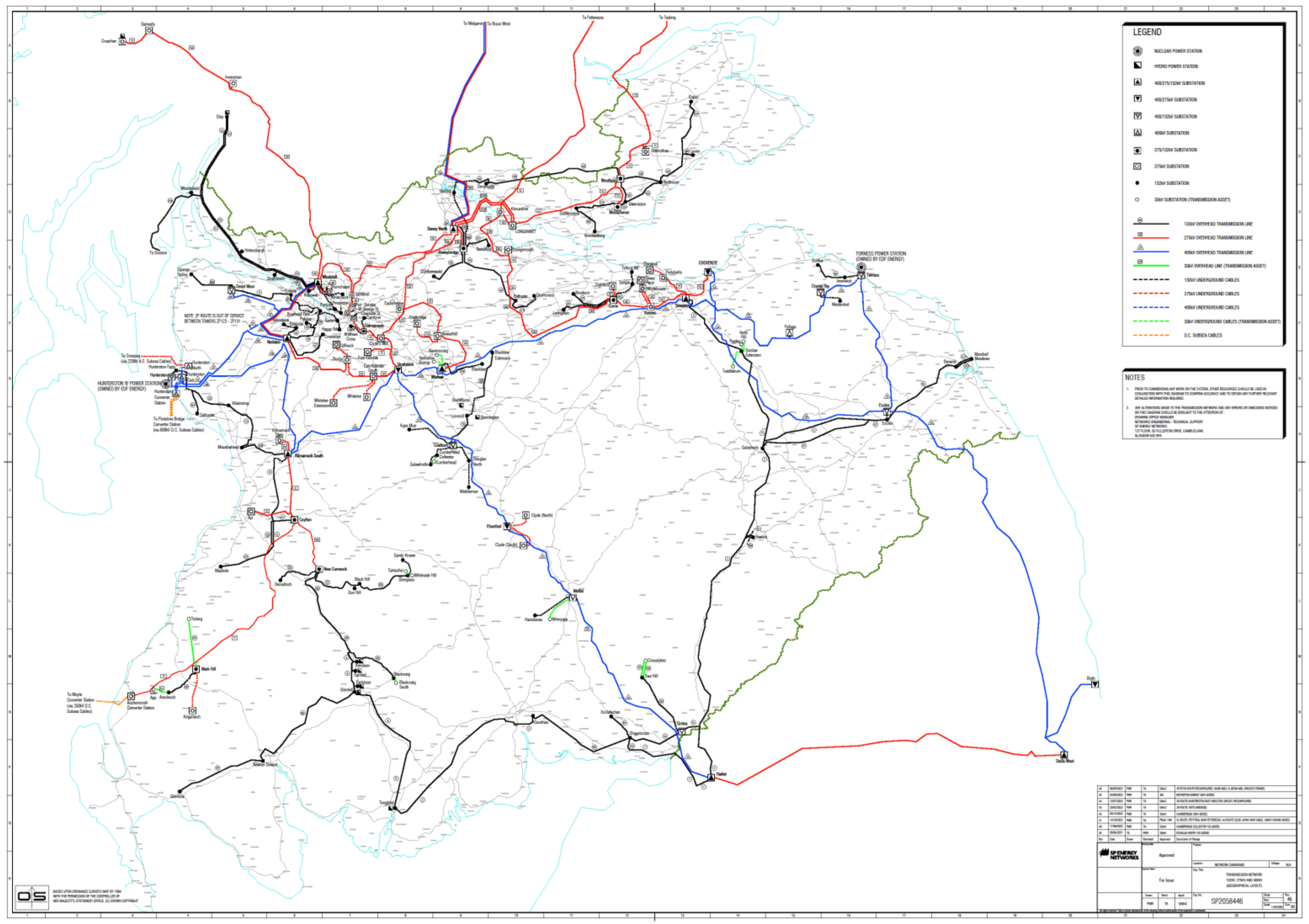

Figure A-1: Networks Diagram of the existing SPT system - Geographical Layout.

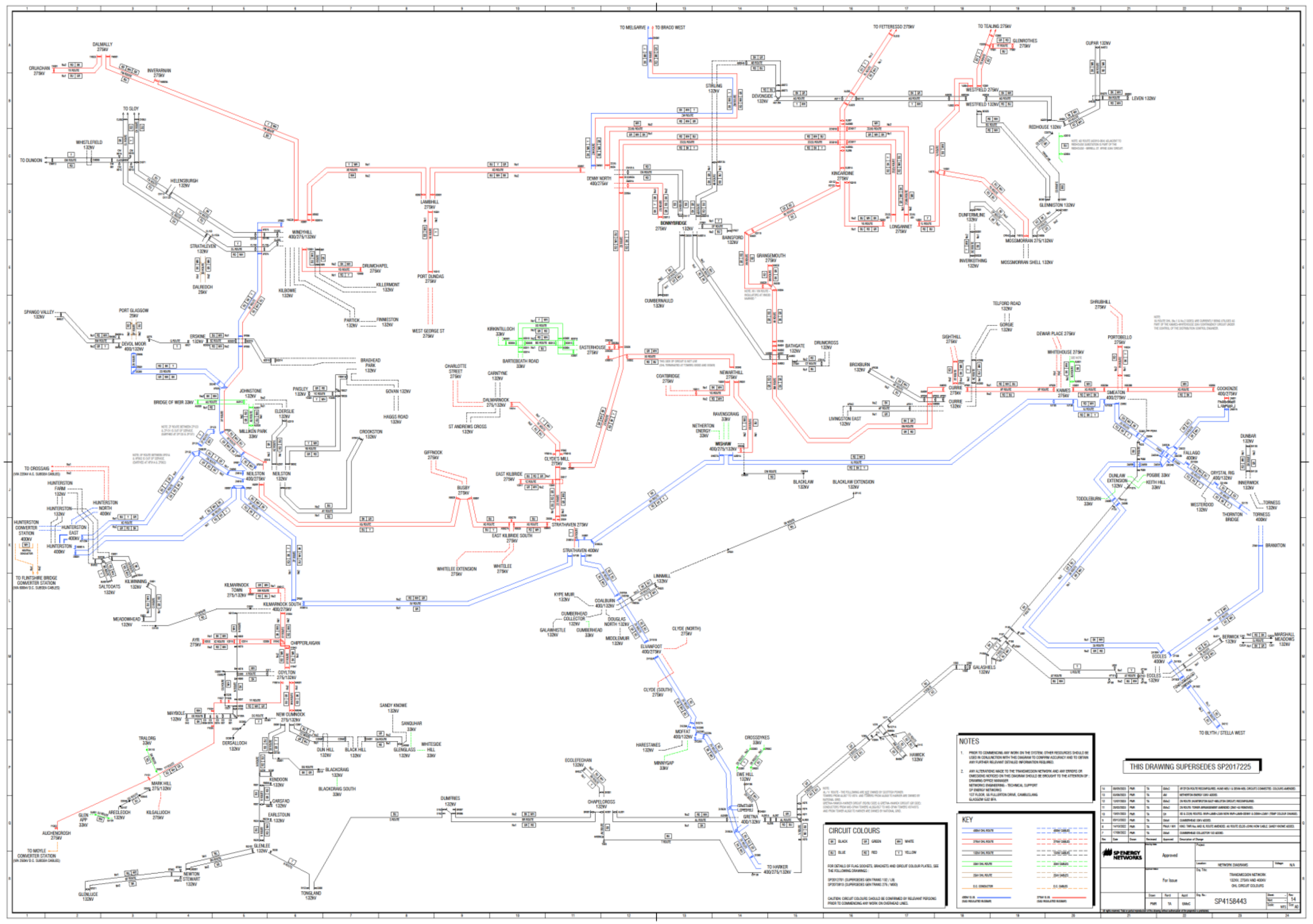

Figure A-2: Networks Diagram of the existing SPT systems – Single Line Diagram.

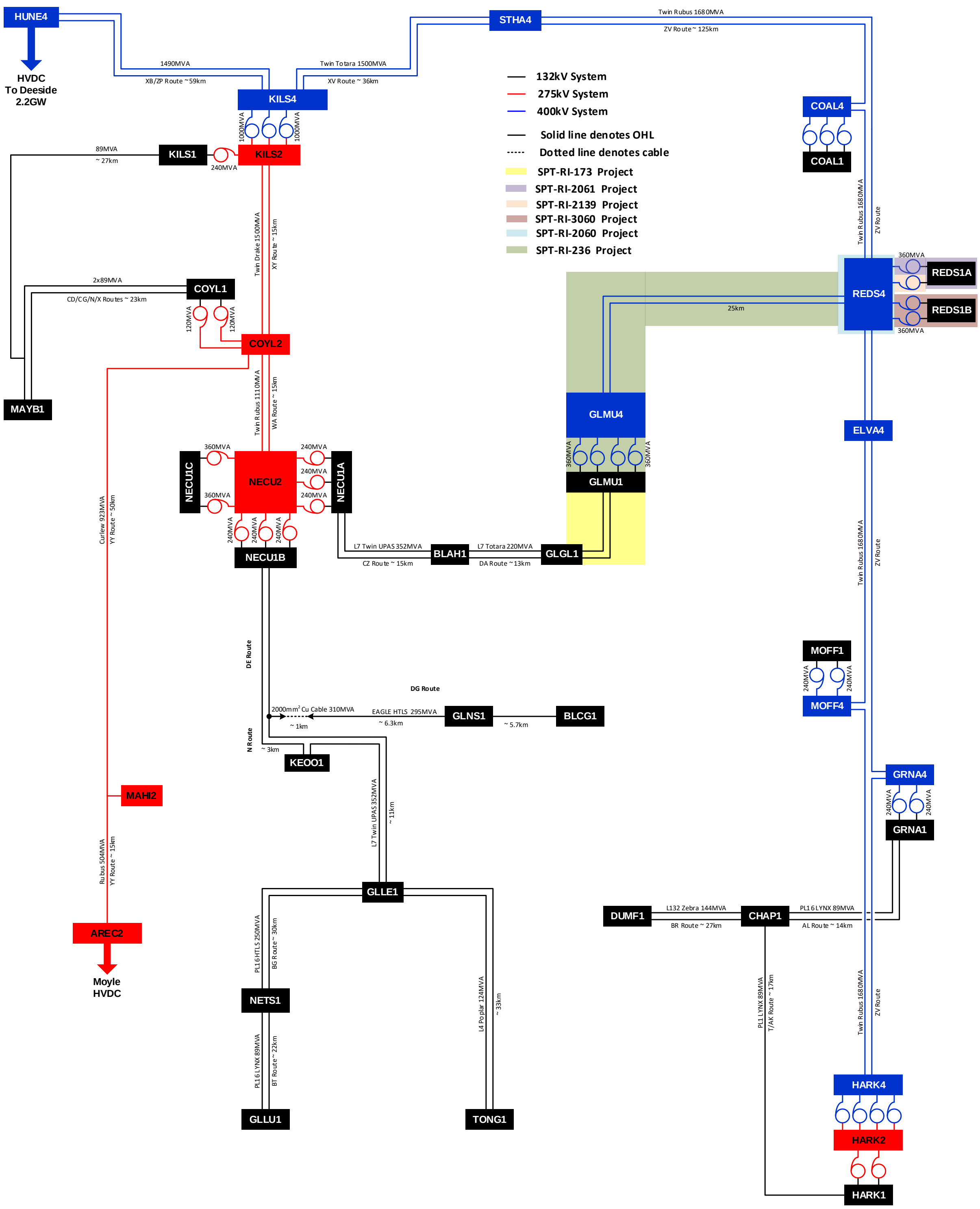

Figure A-3: Single Line Diagram of the Network in the area*

*NB – The Focus of this diagram is the Glenglass to Glenmuckloch 132kV OHL project. The rest of the network shown in subject to change as driven by other network needs. The reinforcement projects: SPT-RI-2060, SPT-RI-2061, SPT-RI-2139, SPT-RI-3060 and SPT-RI-236 have been / will be justified through separate need cases.

[redacted]

Fig[redacted]