MSIP Re-opener Application – SPT-RI-282 Mark Hill SGT4		
Ofgem Scheme Reference/ Name of Scheme	SPT200349 / SPT-RI-282 Mark Hill SGT4	
Investment Category	Local Enabling (Entry)	
Primary Investment Driver	Connection of customer-driven onshore wind generation	
Licence Mechanism/ Activity	Special Condition 3.14 Medium Sized Investment Projects Re-opener and Price Control Deliverable/ Clause 3.14.6 (a)	
Materiality Threshold exceeded (£3.5m)	Yes, as a single project due to the threshold for activity 3.14.6 (a)	
PCD primary Output	Generation: 228MW	
Total Project Cost (£m)	£8.409m	
Funding Allowance (£m)	To be confirmed	Requested £8.409m
Delivery Year	2027/28	
Reporting Table	Annual RRP – PCD Table	
PCD Modification Process	Special Condition 3.14, Appendix 1	

Issue Date	Issue No	Amendment Details
31st January 2025	1	First issue of document.

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Table of Contents

1. Abbreviations / Terminology

Table 1: Table of Abbreviations

Abbreviation	Term
ACM	Asbestos Containing Material
AIS	Air Insulated Switchgear
BEIS	Department for Business, Energy & Industrial Strategy
CDM	Construction Design and Management
CEC	Connection Entry Capacity
CION	Connection and Infrastructure Options Note
CT	Current Transformer
ESO	Electricity System Operator
GSP	Grid Supply Point
ITT	Invitation to Tender
km	Kilometre
kV	Kilovolt
LC	Licence Condition
LSpC	Licence Special Condition
MSIP	Medium Sized Investment Project
MW	Megawatt
NESO	National Energy System Operator
NETS SQSS	National Electricity Transmission System Security and Quality of Supply Standard
NGET	National Grid Electricity Transmission
NOA	Network Options Assessment
OHL	Overhead Line
PCD	Price Control Deliverable
RIIO	Revenue = Incentives + Innovation + Outputs
SCADA	Supervisory Control and Data Acquisition
SGT	Supergrid Transformer
SHET	Scottish Hydro Electric Transmission
SPT	SP Transmission
SPEN	SP Energy Networks
STC	System Operator – Transmission Owner Code
VDUM	Volume Driver Uncertainty Mechanism
VT	Voltage Transformer

2. Reference Documents

Table 2: Table of Reference Documents

Document Reference	Title
SPEN-RIIO-T2_Business_Plan	SP Energy Networks RIIO T2 Business Plan 2021 - 2026
SPT20029 EJP	RIIO-T2 Engineering Justification Paper: SPT-RI-206 - Mark Hill SGT3 240MVA

3. Introduction

This MSIP Re-opener application sets out SPT's plans to carry out reinforcement work at Mark Hill 275/132kV Substation (ref. SPT-RI-282), with works commencing in the RIIO-T2 period (April 2021 – March 2026) and completing in RIIO-T3. These works comprise the installation of Mark Hill SGT4, a 275/132kV 240MVA Supergrid Transformer (SGT) and all associated work, including the extension of the substation platform and 275kV and 132kV busbar systems, environmental, civil and protection and control works. These works will increase the substation capacity and enable the connection of 228MW of contracted onshore wind generation (and co-located battery energy storage system) via Mark Hill 275kV Substation.

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

"3.14.6 The licensee may apply to the Authority for a direction amending the outputs, delivery dates or associated allowances in Appendix1 in relation to one or more of the following activities:

(a) a Generation Connection project, including all infrastructure related to that project, the forecast costs of which are at least £4.24m more or less than the level that could be provided for under Special Condition 3.11 (Generation Connections volume driver)"

Applying the RIIO-T2 Generation Connections Volume Driver Uncertainty Mechanism (VDUM) to this project results in the £8.409m estimated total project cost being £4.309m higher than the £4.100m allowance provided by the VDUM. An MSIP Re-opener application is therefore required.

Full justification for the preferred investment option is presented within this MSIP Re-opener application document, together with a detailed description of the proposed solution. The costs presented in Section 7 are market-tested and have a high degree of cost maturity. The project delivery plan is detailed in Section 8.

3.1 Structure of Document

This MSIP Re-opener application is structured as follows:

Section 4 – Background and Needs Case

This section outlines the background to the proposed works and details the key project drivers.

Section 5 – Assessment of Options

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

Section 6 – Proposed Works

This section provides a description of the proposed solution. It sets out the project scope and other key supporting information.

Section 7 – Project Cost Estimate

This section summarises the estimated cost of the selected option.

Section 8 – Project Delivery

This section outlines the approach which is being taken to deliver the project.

Section 9 – Conclusions and Recommendations

This section summarises the conclusions and includes recommendations to be taken.

3.2 Requirements Mapping Table

Table 3 maps the requirements set out within Chapter 3 of the RIIO-T2 Re-opener Guidance and Application Requirements Document[1] against specific sections within this document.

Table 3: Requirements Mapping Table

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

[1] RIIO-2 Re-opener Guidance and Application Requirements Document: Version 3

4. Background and Needs Case

4.1 Statutory and Licence Obligations on SP Transmission plc

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

- 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.

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

- To always 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 always plan and develop its transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) and in so doing take account of National Grid Electricity System Operator's (NGESO's), now the National Energy System Operator (NESO's) obligations to co-ordinate and direct the flow of electricity on, to and over the GB transmission system (LC D3);
- To make its transmission system available for the purpose of conveying, or affecting the flow of, electricity and to ensure that the system is fit for purpose (LC D2); and
- To offer to enter into an agreement with the system operator upon 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 the following duties on SPT when formulating any relevant proposals. In response to statutory and licence obligations upon it, SPT therefore requires to ensure that the transmission system is developed and maintained in an economic, co-ordinated and efficient manner, in the interests of existing and future electricity consumers, balancing technical, economic and environmental factors.

4.2 Key Project Drivers

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, 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, setting out its ambition deploy 20GW of onshore wind capacity by 2030.

On 9th September 2021, the Department for Business, Energy & Industrial Strategy (BEIS) announced a £265m[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

[2] Biggest ever renewable energy support scheme backed by additional £265 million - GOV.UK (www.gov.uk)

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 next CfD auction, Allocation Round 7, is due to open in 2025 (to be confirmed by DESNZ[4]), with annual auction rounds expected thereafter.

4.3 Investment Drivers in Scotland

The Scottish Government has committed to a 2045 target for the net zero emissions of all greenhouse gases. Underpinning this ambition is the effort to attain up to 11GW installed offshore wind capacity by 2030. The Scottish Government is also taking steps to reach a total installed onshore wind capacity of 20GW by 2030.

The installed green energy capacity in Scotland grew by roughly 10GW between 2010 and Q1 2024. Onshore wind contributed the largest share to this growth and has a current installed capacity of over 9GW[5]. Progress against these objectives have been propelled by the Scottish and UK Government climate change commitments, rich wind resource in the country, availability of technical expertise and demand for installed capacity.

SPT is the transmission licensee responsible for transporting energy in central and southern Scotland. SPT operates over 150 substations within its network. Operating a licence area which covers regions of abundant renewable energy resources, SPT plays a crucial role in the Government's net zero targets.

As illustrated in Figure 1, the south west region of the SPT licence area is marked by the highest density of wind farm developments, in part due to the favourable wind conditions. Consequently, there is ahigh volume of transmission connection requests from onshore wind developments in this part of the country.

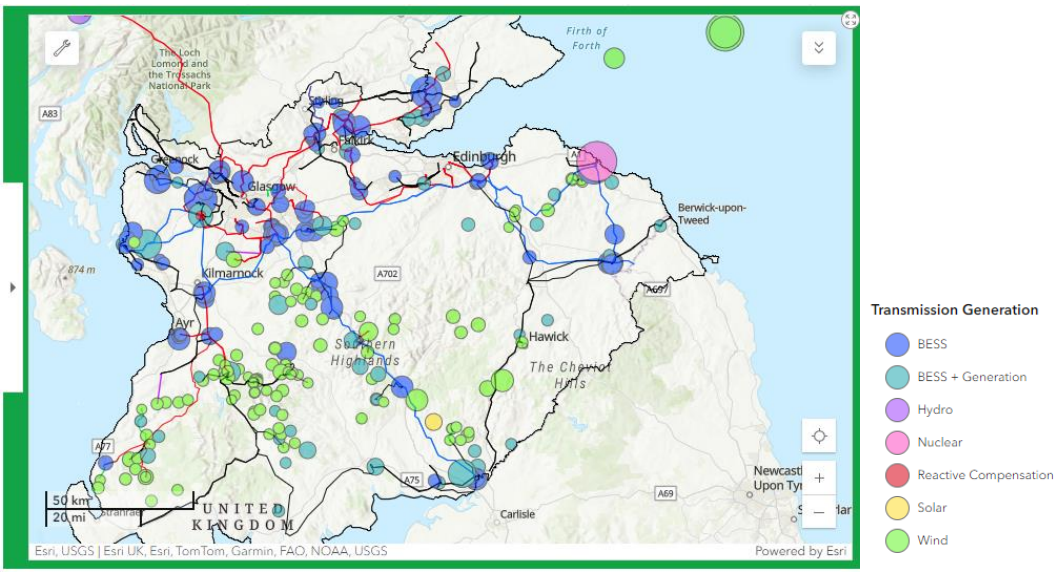


Figure 1 : Contracted Onshore Wind and other Generation Technologies in SPT Licence Area

[3] BEIS Electricity Generation Costs (2020) - GOV.UK (www.gov.uk)
[4] Supply Chain Plan Guidance - Allocation Round 7
[5] Renewable Electricity Capacity - Energy Statistics for Scotland - Q1 2024 - gov.scot (www.gov.scot)

4.4 Mark Hill 275/132kV Substation – Background

A geographic overview of the existing SPT system is provided in Appendix A and an extract, indicating existing transmission connectivity in proximity to Mark Hill 275/132kV Substation, is included below in Figure 2.

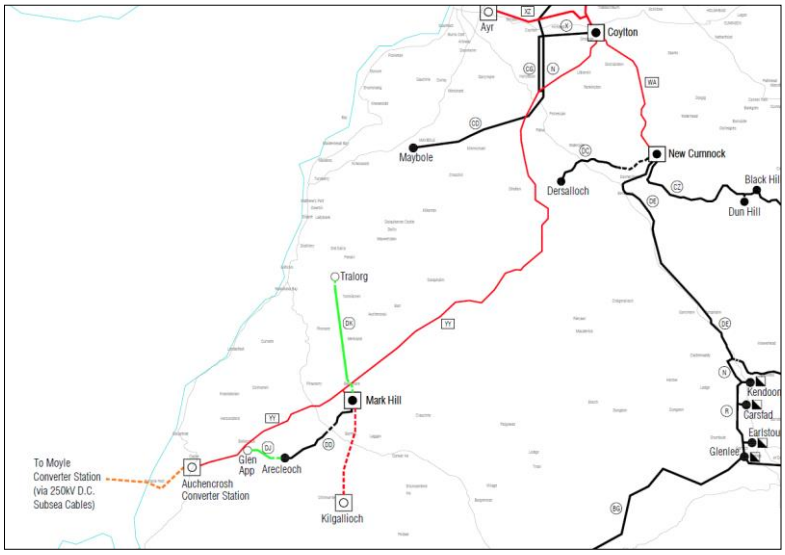


Figure 2 : Geographic Indication of Mark Hill 275/132kV Substation

Mark Hill 275/132kV Substation was constructed in 2009 to facilitate the connection of Mark Hill Wind Farm and provides a connection to the 275kV overhead line between Coylton and Auchencrosh.

Today, Mark Hill 275/132kV Substation serves as one of the main 'collector' sites for onshore wind energy developments in the SPT area. It facilitates the connection of 493.2MW of renewable generation across the Mark Hill, Arecleoch, Glen App, Kilgallioch and Tralorg Wind Farms. This connected generation is summarised in Table 4 below:

Table 4: Connected Generation

Site	Connection Status	Capacity (MW)
Mark Hill	Connected	53
Tralorg	Connected	20
Arecleoch	Connected	114
Glen App	Connected	32.2
Kilgallioch	Connected	274[6]
Total Capacity (MW)		**493.2**

4.5 Mark Hill 275/132kV Substation – Contracted Connections

South west Scotland is an area rich in wind energy resource. The current renewable generation position at Mark Hill 275/132kV Substation is summarised as follows:

- 493.2MW currently connected via Mark Hill 275/132kV Substation; and

[6] The connected capacity at Kilgallioch is currently 228MW, contracted to increase to 274MW during Q2 2025.

- 1033MW of additional capacity contracted to connect via Mark Hill 275/132kV Substation.

In order to connect a significant element of the 1033MW contracted generation capacity in a manner that is compliant with the relevant technical standards, it is necessary to reinforce Mark Hill 275/132kV Substation through the provision of additional 275/132kV Supergrid Transformer capacity:

- **Mark Hill SGT3**: A RIIO-T2 Baseline project (Scheme Ref. SPT20029/ SPT-RI-206) to establish a new 275/132kV 240MVA Supergrid Transformer (SGT3) at Mark Hill. Of the 1033MW contracted generation capacity, 255MW has secured planning consent and is scheduled to connect next year via the commissioning of Mark Hill SGT3 and its parallel operation with the existing Mark Hill SGT2. For the avoidance of doubt, works associated with Mark Hill SGT3 are outside of the scope of this MSIP Re-opener application.
- **Mark Hill SGT4**: The subject of this MSIP Re-opener application, encompassing the establishment of a further 275/132kV 240MVA Supergrid Transformer (SGT4) at Mark Hill. Of the 1033MW contracted generation capacity, 228MW is contracted to connect via the commissioning of Mark Hill SGT4.

It is proposed to connect the 550MW balance of contracted generation via a new 275kV feeder and associated 275kV busbar extension. These works form part of the [redacted] and are outside of the scope of this MSIP Re-opener application.

Table 5 below summarises the overall contracted generation position:

Table 5: Contracted Generation – Mark Hill SGT3, Mark Hill SGT4 and Direct 275kV Feeder

Project	Site	Connection Status	Consent Status	Capacity (MW)	Contracted Energisation Date
[redacted]					
SGT4 / SPT-RI-282 (This paper)	Knockodhar	Contracted	No	120	Apr-28[7]
	Clauchrie	Contracted	No	108	May-33[8]
	Capacity via SGT4			**228**	
[redacted]					
	Total Contracted Capacity			**1033**	

The contracted renewable generation cannot be accommodated without the provision of additional 275/132kV Supergrid Transformer capacity in the form of Mark Hill SGT4.

[redacted]

A Bilateral Connection Agreement is in place between the NESO and the developers of both the Knockodhar and Clauchrie Wind Farms, with Mark Hill SGT4 (SPT-RI-282) identified as Enabling Works. Corresponding Transmission Owner Construction Agreements are in place between NESO and SPT.

Reinforcement of Mark Hill 275/132kV Substation to facilitate the connection of Mark Hill SGT4 is necessary to accommodate the 228MW contracted renewable generation capacity. The proposed configuration of the substation, and the works associated with this MSIP Re-opener application, are indicated in Figure 3 below.

Figure 3 : SPT-RI-282 Mark Hill SGT4

The detailed design of the site will also facilitate the primary system configuration indicated in Figure 4 below (a revised 132kV configuration which retains two 132kV circuit breakers on the low voltage side of SGT4), should ongoing analysis of harmonic performance confirm the requirement to ultimately couple SGT3 and SGT4 at 132kV.

Discussion of the alternative reinforcement options considered can be found in Sections 5.

Figure 4 : Detailed design provision made for alternative primary system configuration

4.6 NESO Connections Reform

As Ofgem is aware, a period of significant industry-wide Connections Reform activity is currently underway, led by the NESO. The NESO submitted its final Connections Reform recommendations to Ofgem for approval on 20th December 2024. With recent publication of the UK Government's Clean Power 2030 Action Plan, the signal from the UK Government is clear in that Connections Reform must align with the ambitions of the Clean Power 2030 Action Plan, and that over-capacity of BESS, solar and onshore wind projects in the current connections queue must be addressed.

At the time of submitting this MSIP application, Ofgem has yet to opine on its Connections Reform decision, and it is unclear which connecting projects will meet the necessary criteria for securing a Gate 2 connection offer by the end of May 2025, given the recent grandfathering provisions which have been announced.

This uncertainty could have an impact on the investment figures sought within this MSIP application. Where any contracted connecting parties fail to secure a Gate 2 connection offer following the Gate 2 to Whole Queue Connections Reform exercise, their securities and allocation of costs will also fall away. Where this is the case, this will impact the current capital expenditure requested by SPT in this MSIP application, albeit this will not affect the works as stated in this submission. Therefore, following completion of the Gate 2 to Whole Queue exercise, SPT will review the contracted parties due to connect via Mark Hill SGT4 and will endeavour to inform Ofgem (i) where there is a change to the contracted connecting parties seeking to connect, and (ii) where there is any revision to the requested MSIP investment figures to reflect this change in the contracted background, for further Ofgem review.

4.7 Alignment with RIIO-T2 Strategic Goals

As described in our RIIO-T2 plan[9] for the five-years to the end of March 2026, to mitigate the impacts of climate change and achieve a low-carbon energy system requires a level of focused effort and commitment never seen before. The mass electrification of transport and heat has only started and there is a huge amount required to build on the timely progress already made in the electricity sector.

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

These goals and their alignment with the Mark Hill SGT4 project, are summarised below:

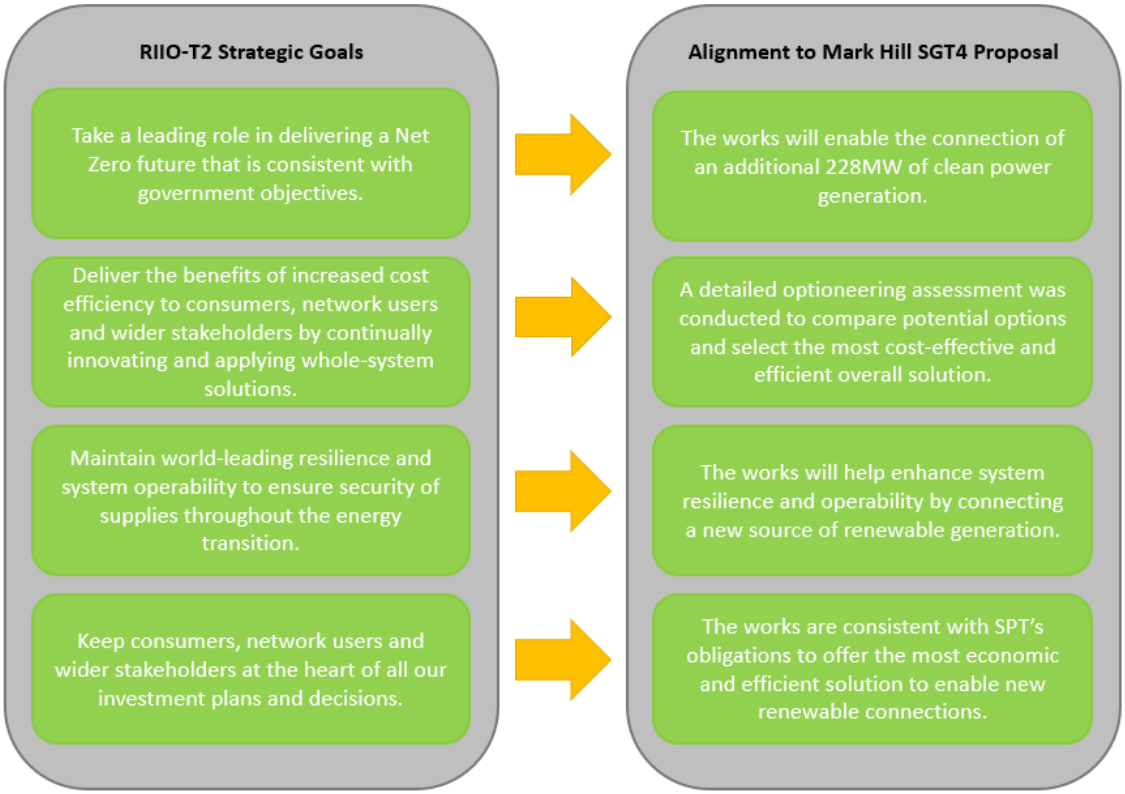


Figure 5 : Alignment of the Mark Hill SGT4 Proposal with SPT RIIO-T2 Strategic Goals

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

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

By establishing Mark Hill SGT4, transmission capacity will be increased to enable the connection of 228MW of contracted renewable generation capacity in the surrounding area. This will contribute towards a reduced reliance on fossil fuel electricity generation sources.

[9] SP Energy Networks RIIO-T2 Business Plan

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

Following receipt of applications for connection, SPT has worked with NESO throughout the connection offers process to issue connection offers which reflect the most cost-effective connection solutions on a whole systems basis, aligned with customer requirements and compliant with the relevant technical standards.

During the optioneering phase of this project various solutions were assessed to establish the most cost-effective engineering solution. More information can be found in Section 5.

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

The installation of Mark Hill SGT4 will help maintain system resilience and operability by enabling the connection of new sources of renewable generation.

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

The completion of Mark Hill SGT4 installation will allow SPT to satisfy network users request for connection and is consistent with SPT's statutory and licence responsibilities, including Licence Condition D4A.

Key stakeholders have been consulted during the development of the proposed solution and we will continue to engage with stakeholders throughout the project delivery process. Stakeholder engagement has included statutory consultees associated with the planning application for these works (e.g. Local Authority, SEPA, NatureScot) and the third-party landowner Forestry Land Scotland. More detail on stakeholder engagement can be found in Section 8.5.

The Mark Hill SGT4 installation will continue to align with our future strategic ambitions.

5. Assessment of Options

This section presents a narrative of the options that were considered at the conceptual planning phase of this project. Our environment, network users and the communities we serve are at the forefront of SPT's business decisions. Our emphasis is on no-build or low-build options which deliver network capacity improvement sooner, and at the least impact on our communities and customers. These options are developed to accommodate the rapid generation developments in the regions under review.

5.1 Existing System Configuration at Mark Hill

Mark Hill 275/132kV Substation serves a number of renewable generation connections in the area. The substation comprises a single busbar 275kV Air Insulated Switchgear (AIS) arrangement with one 'incoming' circuit from the Coylton to Auchencrosh overhead line. There are currently three 'outgoing' 275kV circuits: Mark Hill SGT1, SGT2 and Mark Hill - Kilgallioch 275kV, as illustrated in Figure 6.

Mark Hill SGT1 is a 275/33kV 120MVA transformer that connects to Mark Hill Windfarm 1A and Mark Hill Windfarm 1B. The 33kV busbar system at Mark Hill has been extended to include the connection of Tralorg Windfarm.

Mark Hill SGT2 is a 275/132kV 240MVA transformer that connects to Arecleoch 132kV Substation. This transformer also connects a 60MVAr 33kV tertiary connected shunt reactor.

The third 275kV 'outgoing' circuit connects Mark Hill 275kV Substation to Kilgallioch 275kV Substation.

Figure 6 : Existing Configuration – Mark Hill 275/132kV Substation

Figure 7 : Ariel View of Existing Mark Hill 275/132kV Substation

As detailed in Section 4, the RIIO-T2 Baseline project (Scheme Ref. SPT20029/ SPT-RI-206) will establish a new 275/132kV 240MVA Supergrid Transformer (SGT3) at Mark Hill. This project, which is in delivery and programmed to complete in October 2026, is not indicated in Figures 6 or 7 above.

Building on the commissioning of Mark Hill SGT3, a discussion of further alternative reinforcement options can be found in Sections 5.1.

5.2 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.

5.2.1 Option 1 – Do Nothing or Delay

A 'Do Nothing' or 'Delay' option is not credible in relation to this project and would be inconsistent with SPT's various statutory duties and licence obligations, 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 STC and associated Construction Planning Assumptions provided by the NESO. The proposed works are identified as Enabling Works in the connection agreements relating to the Knockodhar and Clauchrie Wind Farm projects in Table 5.

5.2.2 Option 2 – Uprate Mark Hill SGT2 and SGT3 to 360MVA

This option seeks to accommodate the connection of Knockodhar and Clauchrie Wind Farms via Mark Hill substation by replacing the existing 240MVA 275/132kV SGT2 and the proposed 240MVA 275/132kV SGT3 with higher capacity transformers in order to provide a capacity equivalent to the introduction of a new 240MVA SGT4 at the substation. This option entails the following:

- Replacement of 240MVA 275/132kV SGT2 with 360MVA 275/132kV transformer.
- Increasing the size of the proposed 240MVA 275/132kV SGT3 to 360MVA.

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

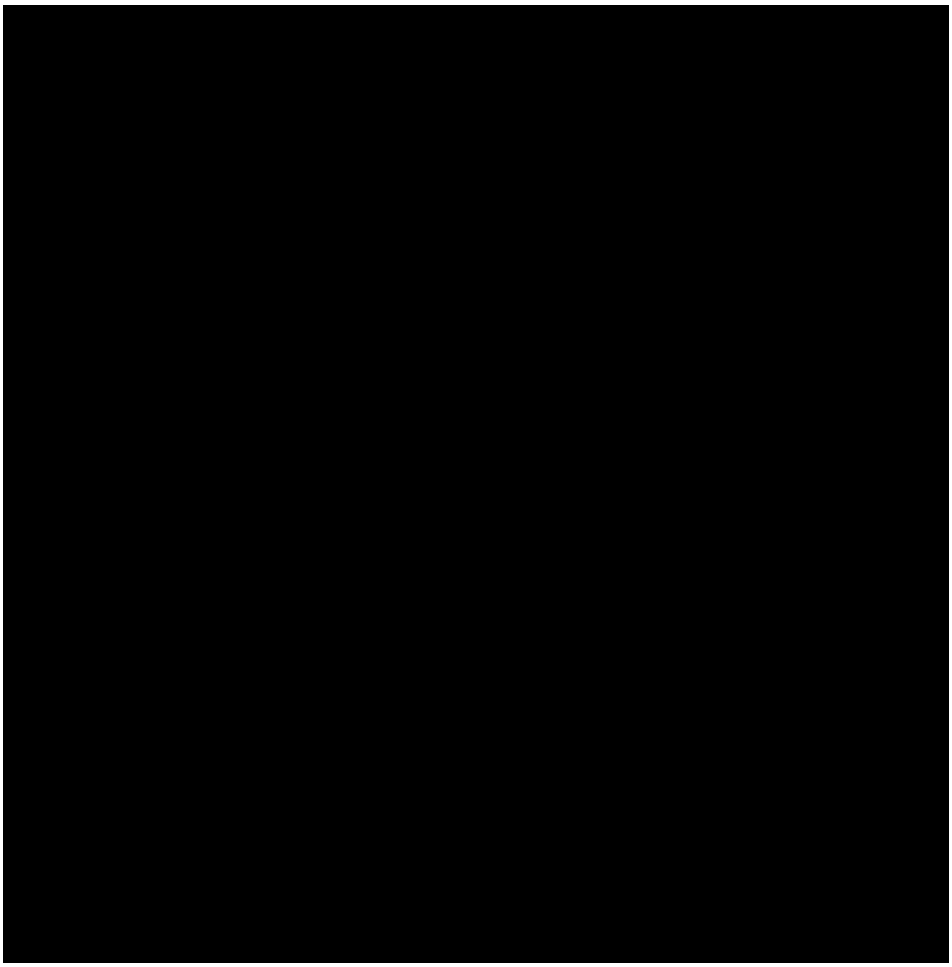
- This option costs approx. £16.06m (2018/19 price base).
- This option would require an extended outage period at Mark Hill substation and a lack of system access for the wind farms associated with SGT2 during its replacement.
- This option would result in the early decommissioning of existing Mark Hill SGT2. Installed in 2010, the existing SGT2 would be expected to remain in service until 2050 as a minimum.
- This option neither reflects an efficient utilisation of resources nor does it reflect a co-ordinated development of the transmission network.

5.2.3 Option 3 – Provide a Connection for Clauchrie Wind Farm at Newton Stewart Substation

During the assessment of the Clauchrie Wind Farm application, this option was identified to provide the wind farm with a connection via Newton Stewart 132kV Substation by sharing an overhead line circuit with [redacted] This would involve establishment of a 132/33kV substation at the wind farm site to house a 132/33kV 90MVA transformer and connect the wind farm to a tee point at an appropriate location via a 132kV overhead line (approx. 7km from Clauchrie Wind Farm to the tee point). From the location of the tee point, a 132kV circuit shared by the two wind farms would be installed to Newton Stewart 132kV Substation (approx. 22km). The indicative single line diagram and geographic overview of this option are shown in Figure 8 and Figure 9 respectively. Note that the shared asset solution was provisionally identified as SPT-RI-283 at the time however this option was not progressed.

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

- The overall cost for this option was approx. £9.22m (2018/19 price base) which is higher than the connection via Mark Hill SGT4 (Option 4).
- The wind farms would be subject to circuit capacity limitations beyond Newton Stewart 132kV Substation, which is connected to Glenlee and ultimately Kendoon and New Cumnock via a 132kV overhead line circuit which is currently rated at 89MVA (summer pre-fault rating). The wind farm connections would have been contingent upon the uprating of the overhead line circuits from New Cumnock to Kendoon and Kendoon to Glenlee (part of the Kendoon to Tongland Reinforcement (KTR) project), and the Glenlee to Newton Stewart circuits, ultimately delaying their connection dates relative to Option 4.
- Given the scope of work and associated delay to the connection of these renewable generation projects (noting the requirement to secure consents and land rights for a significant section of new 132kV overhead line and/ or cable of approximately 22km from Newton Stewart to the tee point location), this option is not the most economic and efficient solution as compared to the proposed Option 4.



5.2.4 Option 4 – Install Mark Hill SGT4

This option seeks to accommodate the connection of Knockodhar and Clauchrie Wind Farms via Mark Hill substation, by establishing a new 240MVA 275/132kV SGT4. Mark Hill 275kV Substation is the nearest existing transmission substation to the developments.

The associated works at Mark Hill substation are summarised as follows:

- Extend the substation civil platform, fence line and 275kV busbar system.
- Install one 275/132kV 240MVA (SGT4) transformer to provide connection to the two 132kV wind farm circuits.
- Install one 275kV AIS circuit breaker on the high voltage side of SGT4.
- Establish 132kV busbar connections.

The overall cost for this option is estimated to be £8.409m (2018/19 price base). The proposed configuration at Mark Hill is detailed in Figure 3 above and Figure 10 below.

Figure 10 : Single Line Diagram indicating Mark Hill SGT4 [10]

The advantages of this proposal include:

- The new SGT4 increases transformer capacity at Mark Hill by 240MVA, enabling the connection of an additional 228MW of contracted renewable generation.
- This option avoids any prolonged outages, system assess restrictions and early asset disposal associated with the replacement of an existing transformer.

5.3 Option Assessment

As described in our RIIO-T2 Business Plan Annex 8[11], while most engineering justification papers have a Cost Benefit Analysis (CBA) aligned with the RIIO-T2 CBA model, projects in the following categories do not:

- Live projects rolling over from RIIO-T1, since they have already initiated, with decisions made during the previous price control.
- Customer connection projects, as the proposed approach is based on agreement with the connecting party as they will bear a sizeable proportion of the costs incurred.
- TO Reinforcements associated with new connections, where the options considered are evaluated purely based on the lowest cost solution, which meets the project objectives, as the benefits are all comparable.

[10] Note: Disconnectors 704, 804 and 'downstream' assets to the wind farm sites are outwith the scope of the Mark Hill SGT4 project and this MSIP Re-opener application.
[11] Annex 8 - Cost Benefit Analysis Methodology (spenergynetworks.co.uk)

- Projects justified through the Network Options Assessment process as these are subject to an extensive and rigorous CBA process by the Electricity System Operator who can consider market options, and different options which may be offered by Transmission Owners.

Projects in the four categories above have an associated document (this MSIP Re-Opener application in respect of the Mark Hill SGT4 project) explaining the feasible options and the reasoning behind the selection of the preferred investment option.

The options relating to the connection of an additional 228MW of contracted renewable generation capacity in the Mark Hill area are described in Section 5.2 above, while Table 6 below summarises the key benefits and disadvantage of each option, together with an indication of estimated cost.

Table 6: Option Benefits, Drawbacks and Selection Outcome

No.	Option	Estimated Capital Cost[12]	Key Advantage	Key Disadvantage	Option Outcome
1	Do Nothing or Delay	-	None	Failure to comply with statutory duties and licence obligations.	Rejected
2	Uprate Mark Hill SGT2 and SGT3 to 360MVA units	£16.06m	Provides the necessary additional capacity and connection points for the wind farms.	Significant economic disadvantage relative to Option 4. Early decommissioning of existing Mark Hill SGT2 and planned SGT3, results in early asset disposal, lengthy outages and system access restrictions during construction period.	Rejected
3	Provide a connection at Newton Stewart substation	£9.22m	Provides the necessary additional capacity and connection points for the wind farms.	Significant economic, environmental and programme disadvantages relative to Option 4. Significant new 132kV circuit (OHL/cable) of approx. 22km from Newton Stewart to the tee location.	Rejected
4	Install Mark Hill SGT4	£8.409m	Lowest capital cost option which provides the necessary additional capacity and connection points for the wind farms. Avoids any prolonged outages, system assess restrictions and early asset disposal associated with the replacement of existing transformer.	Requires substation platform extension to accommodate an extended 275kV busbar and one new 275/132kV SGT4.	Proposed

The addition of a fourth SGT at Mark Hill provides the required thermal capacity increase in the most efficient manner. Option 4 is therefore the preferred investment option, delivering the additional transmission capacity required at minimum capital cost.

[12] All values are in 2018/19 prices.

6. Proposed Works

6.1 Project Summary

As described in earlier sections, the most appropriate option to deliver the required capacity upgrade is to extend the Mark Hill substation platform and install SGT4. The proposed configuration of Mark Hill 275/132kV Substation is indicated in Figure 10 above.

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

a) Installation of Additional Supergrid Transformer

Figure 3 indicates the works summarised below:

- Extend the substation civil platform, fence line and 275kV busbar system.
- Install one 275/132kV 240MVA (SGT4) transformer to provide connection to two 132kV wind farm circuits.
- Install one 275kV AIS circuit breaker on the high voltage side of SGT4.
- Establish 132kV busbar connections and two points of connection for circuits to Knockodhar and Clauchrie Wind Farms.

b) Environmental and Consent Works

- Planning consent is required for the proposed works at Mark Hill Substation. This was obtained from South Ayrshire Council in June 2024 for all substation extension works associated with both the Mark Hill SGT3 and Mark Hill SGT4 projects. Additionally, land consents have been secured to cater for both projects with landowner agreements obtained to extend the existing compound.
- Ecological, hydrological and archaeological surveys have been carried out for the scope of works and the findings will inform the final detailed design and construction stages.
- Excavated peat material associated with the formation of the platform extension is being taken to a mine restoration facility to help reinstatement of that area.
- Construction of a new oil containment scheme for SGT4 based on the current standards and pollution prevention guidelines.
  Note that no environmental concerns or environmental works have been identified at this stage. An Environmental Management Plan (EMP) has been prepared prior to works commencing on the substation.

c) Pre-Engineering Works

As part of the pre-engineering works, the following surveys and studies have been completed:

- Survey of existing documentation.
- Earthing survey at Mark Hill 275/132kV Substation (undertaken as part of the works included in Mark Hill SGT3 project). The earthing report will be updated upon completion of new platform when soil resistivity measurement will be undertaken.
- Topographical survey of substation location.
- Access route survey.
- Noise survey;

- Geo-environmental investigation to identify the relevant geotechnical parameters to facilitate the civil engineering design works and to identify any contaminated ground present.
- Surveys to identify any historical significance of the site in terms of archaeological assessment.
- SGT4 transformer transportation study, with a swept path analysis and route survey has also been undertaken at the design stage. This will be revisited nearer to the delivery stage to assess the impact on external and internal infrastructure.

d) Civil Engineering Works

The primary civil engineering works comprise:

- Substation platform extension and associated drainage.
- Extension of the compound internal access road.
- The design and construction of new foundations and structures necessary to support the new equipment within the existing substation compound.
- Enabling works to achieve the above e.g. works to facilitate temporary and/or enduring accesses for construction, operation and maintenance purposes.

6.2 Benefits of the Proposed Works

The primary benefit of this proposal is that it allows the connection of additional contracted low carbon generation to Mark Hill 275/132kV Substation.

There are no relevant drawbacks associated with this package of works.

7. Project Cost Estimate

The cost estimates below include all contracts required for completion of the project.

7.1 Estimated Total Project Cost

Aligned with the format of the Re-Opener Pipeline Log, Table 7 details expected energisation year and our current view of potential direct capital expenditure in RIIO-T2.

Table 7: Estimated Incidence of Expenditure

	Potential direct capex value per year, £m, 18/19 price base									
Energisation Year	Pre-RIIO-T2: direct capex	Yr. 21/22: direct capex	Yr. 22/23: direct capex	Yr. 23/24: direct capex	Yr. 24/25: direct capex	Yr. 25/26: direct capex	Yr. 26/27 (T3): direct capex	Yr. 27/28 (T3): direct capex	RIIO-T2 Total: direct capex	Total: direct capex
2027/28	0.000	0.000	0.026	2.061	2.208	0.805	2.510	0.799	5.100	8.409

As described in Section 4.3, it should be highlighted that where any contracted connecting parties fail to secure a Gate 2 connection offer following the Gate 2 to Whole Queue connections reform exercise, their securities and allocation of costs will also fall away. This could have an impact on the current capital expenditure requested by SPT above, albeit this will not affect the works as stated in this submission. Therefore, following completion of the Gate 2 to Whole Queue exercise, SPT will review the contracted parties due to connect via Mark Hill SGT4 and will endeavour to inform Ofgem (i) where there is a change to the contracted connecting parties seeking to connect, and (ii) where there is any revision to the requested MSIP investment figures to reflect this change in the contracted background, for further Ofgem review.

7.2 Detailed Costs

Table 8 below provides a cost breakdown representing the latest view of Direct costs for the proposed investment, including details of the procurement strategy and the cost maturity for each contract.

Table 8: Direct Costs, Procurement Strategy and Cost Firmness

Contract Name	Contract Start	Finish Date	Cost (£m)	Procurement Strategy	Cost Firmness
[redacted]					

Contract Name	Contract Start	Finish Date	Cost (£m)	Procurement Strategy	Cost Firmness
[redacted]					
Total			**8.409**		

7.3 Procurement Strategy

SPT Procurement strategy follows a disaggregated model, within which contracts are disaggregated and tendered separately to maximise cost efficiencies. On this project the major contracts to be awarded are for the platform enabling works, civil works (in the extended platform area) and electrical installation/commissioning Balance of Plant works.

The new 240MVA transformer was procured via a bulk order to obtain economies of scale.

SPT also procure several items of equipment directly with manufacturers, utilising ongoing frameworks in place with various suppliers. These frameworks are tendered competitively to achieve the best market rates and are valid for a period of 2 years, giving cost certainty and best market rates.

Individual contract tendering details are included in Table 8.

7.4 Cost Maturity

Aligned with the classification outlined within the “OFGEM Class of Estimate” tab included in the “ET2 UM Submission Template” the table below includes the assessment of cost firmness:

Status of individual contracts is detailed in Table 8 provided in Section 7.2.

Table 9: Cost Firmness Assessment

Cost Firmness as per OFGEM classification	Total Direct Cost (£m)	Total Cost (%)
[redacted]		
TOTAL	8.409	100.0%

As it can be seen in Table 9, [redacted] of the total costs are either incurred already or have been contracted.

This submission is made in compliance with instruction included within RIIO-T3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors[13] ET Specific Annex, Paragraph 2.277, which states that projects with 50% or more expenditure within RIIO-T2 price control period should submit full project allowance request within January 2025 MSIP re-opener window.

The project is included in RIIO-T3 Business Plan Data Table, 6.1_Scheme C&V_Load_Actuals, with the Licence Term of MSIPREt and Project Flag "T2 carry over- no cost assessment" as our understanding is that the full project cost assessment will be completed as part of this MSIP submission.

7.5 Project Risk and Mitigation

Table 10 below provides a breakdown of the individual project risks followed by further detailed explanation regarding mitigation and likelihood. The provision for risk at [redacted] of the cost is proportionate and justified.

[13] RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors | Ofgem

Table 10: Risk Quantification

Risk	Description	Probability	Value (£m)
[redacted]			

[redacted]

[redacted]

[redacted]

7.6 Potential Volume Driver Allowance

Applying the RIIO-T2 Generation Connections VDUM to this project results in a £4.100m allowance provided by the VDUM. The allowance is calculated as per Table 11 below. Please note that this excludes the further allowance permitted under Licence Special Condition 3.36 Opex escalator.

Table 11: Volume Driver Allowance

Volume Driver (*2018/19 price base*)		£m/unit	Unit	Volume Driver Allowance (£m)
Project	Fixed Cost	1.700	1.00	1.700
Shared Use	Transformer, MVA	0.010	240	2.400
Total				**4.100**

Table 12: Comparison of Volume Driver Allowance and Estimated Cost

	Potential direct capex value per year, £m, 18/19 price base									
Description	Pre-RIIO-T2: direct capex	Yr 21/22: direct capex	Yr 22/23: direct capex	Yr 23/24: direct capex	Yr 24/25: direct capex	Yr 25/26: direct capex	Yr 26/27: direct capex	Yr 27/28: direct capex	RIIO-T2 Total: direct capex	Total: direct capex
Allowance	0	0	1.025	1.025	1.025	1.025	0	0	4.100	4.100
Cost	0.000	0.000	0.026	2.061	2.208	0.805	2.510	0.799	5.100	8.409
Variance	0.000	0.000	0.999	-1.036	-1.183	0.220	-2.510	-0.799	-1.000	-4.309

The potential VDUM allowance for the project is lower than the estimated cost by £4.309m. This is more than £4.24m, which is the threshold set in LSpC 3.14.6(a) for consideration under this uncertainty mechanism.

7.7 Total Allowance Request

SPT requests that the following allowance is provided through the MSIP Re-opener mechanism to deliver the works described within Section 6. The requested MSIP allowance will be subject to the Opex escalator mechanism:

Table 13: Requested Direct Allowances

	Direct allowance requested per year, £m, 18/19 price base								
	Pre-RIIO-T2	Yr 21/22:	Yr 22/23:	Yr 23/24:	Yr 24/25:	Yr 25/26:	Yr 26/27:	Yr 27/28:	Total (£m)
Direct Allowances Requested	0.000	0.000	0.026	2.061	2.208	0.805	2.510	0.799	8.409

An aggregated view of the total cost is outlined in Table 14 below:

Table 14: Total Price Control Project Cost Aggregated view

Category	Total Price Control Project Cost (£m)	Price Control Direct Cost (£m)	Contractor Indirects* (£m)	SPT Indirects (£m)
[redacted]				

Contractor Indirects costs are only shown for reference and have been excluded from the potential direct capital expenditure to be funded via the MSIP Re-opener mechanism.

7.8 Regulatory Outputs

It is proposed that the associated Price Control Deliverable is defined as follows:

Table 15: Price Control Deliverable

OSR	Scheme Name	Output	Allowance* Oncosted)	Delivery Date
SPT200349	SPT-RI-282 Mark Hill SGT4	Installation of Mark Hill SGT4 (240MVA) and associated works at Mark Hill 275/132kV Substation.	£9.536m	31st December 2027

*Include Indirect costs calculated using the Opex Escalator uplift (13.4%) on Direct costs.

8. Project Delivery

We have applied our project management approach to ensure that this project 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 draw upon this knowledge and experience to effectively manage this project. We have assigned a dedicated Project Manager to this project who will be responsible for overall delivery of the scope and is the primary point of contact for all stakeholders.

8.1 Delivery Schedule

A standard approach has been applied to the planning phase of this project and that will continue for the reporting and the application of processes and controls throughout the project lifecycle. Table 16 summarises the key project milestones within the delivery schedule.

Table 16: Key Project Milestone

Milestone	Project Phase	Completion Date
1	Consents Obtained	June 2024 - Complete
2	Earthworks commenced	June 2024
3	Commence civils work	September 2026
4	Mark Hill SGT4 Commissioning	August 2027
5	Complete Site works	December 2027

Regular meetings with the Project and Construction Management Teams shall be undertaken to assess the ongoing effectiveness of the Project Management interfaces.

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

8.2 Alignment with other projects

The Mark Hill SGT4 project is one of several projects at Mark Hill Substation during the RIIO-T2 period. Other project works include:

- [redacted]
- [redacted]
- [redacted]
- Mark Hill 132kV STATCOM
- New connection projects including:
  - [redacted]

The works for Mark Hill SGT4 will be co-ordinated with these other projects.

The capital expenditure estimate in Section 7.1 is incremental to the projects detailed above and is related to the installation of Mark Hill SGT4.

8.3 Quality Management

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

8.3.1 Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product are detailed in the Project Risk Register (that is noted in Section 7.5 above).

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

8.3.2 Quality Requirements in Tenders

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

8.3.3 Monitoring and Measuring During Project Delivery

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

The following inspections are completed:

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

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

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

8.3.4 Post Energisation

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

8.4 Stakeholder Engagement

SPT is committed to delivering optimal solutions in all of 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 particular sensitivities that may require increased stakeholder consultation and details specific events that will be held with stakeholders during the course 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 NatureScot, Forestry Land Scotland, and the third-party landowner. We have also engaged with the other stakeholders, including community councils and local residents.

Due to the location and nature of this project, no particular 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.

Stakeholder engagement to date has informed the details of the construction and traffic management plan, and permanent drainage details for the works.

9. Conclusion and Recommendations

This MSIP Re-opener application demonstrates the need to carry out work at Mark Hill 275/132kV Substation to enable the timely and efficient connection of 228MW of contracted onshore wind generation. These works will commence in the RIIO-T2 period (April 2021 – March 2026) and complete in the RIIO-T3 period.

The main conclusions of this submission are:

- The timely connection of low carbon generation, such as 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 establish new transmission infrastructure at Mark Hill 275/132kV Substation to facilitate the connection of 228MW of contracted onshore wind generation, this having been identified as the most economic and efficient option.

- Applying the RIIO-T2 Generation Connections VDUM to this project results in the £8.409m estimated cost being £4.309m higher than the £4.100m allowance provided by the VDUM. An MSIP Re-opener application is therefore required.

- This submission is made in compliance with instruction included within RIIO-T3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors[14] ET Specific Annex, Paragraph 2.277, which states that projects with 50% or more expenditure within RIIO-T2 price control period should submit full project allowance request within January 2025 MSIP re-opener window.

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

- The option being progressed addresses a clear customer need and represents value to GB consumers, therefore, the works should proceed based on the preferred solution (Option 4).

- By virtue of being founded on market-tested costs, the proposed allowance value represents the real efficient cost of the works and should be fully funded.

- [redacted]

[14] RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors | Ofgem

Appendix A - SP Transmission System, Geographic Overview