Scottish & Southern Electricity Networks

SSEN Transmission

RIIO-T2 Business Plan: T2BP-EJP-0049

Peterhead – Inverugie Tee 132kV Overhead Line Works Engineering Justification Paper

1 Executive Summary

Our paper A Risk Based Approach to Asset Management[1] sets out our approach to network risk and how we subsequently identify assets that require intervention to limit the rise of risk over the RIIO-T2 period.

This paper justifies the need for intervention on the 6.7km, 132kV double circuit overhead line (OHL) between Peterhead and the Inverugie Tee. The primary driver for the scheme is the asset condition with a secondary driver of network resilience.

The results of the optioneering and detailed analysis presented in this paper conclude that the full refurbishment of the Peterhead - Inverugie Tee 132kV double circuit OHL and the concurrent reconductoring of phase and earth conductors is the optimal asset intervention solution. This work delivers an OHL asset that will maintain safe & secure operation for the north east 132kV network fed from Peterhead Substation.

The scope of the Peterhead - Inverugie Tee OHL upgrade is as follows:

- Reconductor 6.7km of existing 70mm^2 ACSR Horse earth wire Keziah equivalent Optical Ground Wire (OPGW) conductor;
- Reconductor 6.7km of existing 175mm^2 Aluminium Conductor Steel Reinforced (ACSR) Lynx phase conductors with 300mm^2 All Aluminium Alloy Upas Conductors;
- Tower painting, tower strengthening and repairing concrete muffs; and,
- Mitigation works including ground works, panel extensions and a new tower to mitigate clearance infringements as identified.

This scheme will cost £10.3m and will deliver the following outputs and benefits during the RIIO T2 period:

- A long term monetised risk benefit of R£1388.8m;
- A reduction of total network risk calculated as R£6.7m; and,
- Improved operational flexibility and resilience in line with our goal to aim for 100% transmission network reliability for homes and businesses.

The Peterhead – Inverugie Tee scheme is not flagged as eligible for early or late competition due it being under Ofgem's £50m and £100m thresholds respectively.

[1] A Risk Based Approach to Asset Management

Name of Scheme/Programme	Peterhead – Inverugie Tee 132kV Overhead Line Works
Primary Investment Driver	Asset Health (Non-Load)
Scheme reference/ mechanism or category	SHNLT2018
Output references/type	NLRT2SH2018
Cost	£10.3m
Delivery Year	RIIO T2
Reporting Table	C0.7 Non-Load Master Data
Outputs included in RIIO T1 Business Plan	No

2 Introduction

This Engineering Justification Paper sets out our plans to undertake network condition work during the RIIO-T2 period (April 2021 to March 2026). The planned work is on the OHL between Peterhead and the Inverugie Tee located in the north east as shown on the map in Figure 1.

The Engineering Justification Paper is structured as follows:

Section 3: Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the need.

Section 4: Optioneering

This section presents all the options considered to address the need that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for detailed analysis in Section 5.

Section 5: Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgement contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

Section 6: Conclusion

This section provides summary detail of the selected option. It sets out the scope and outputs, costs and timing of investment and where applicable other key supporting information.

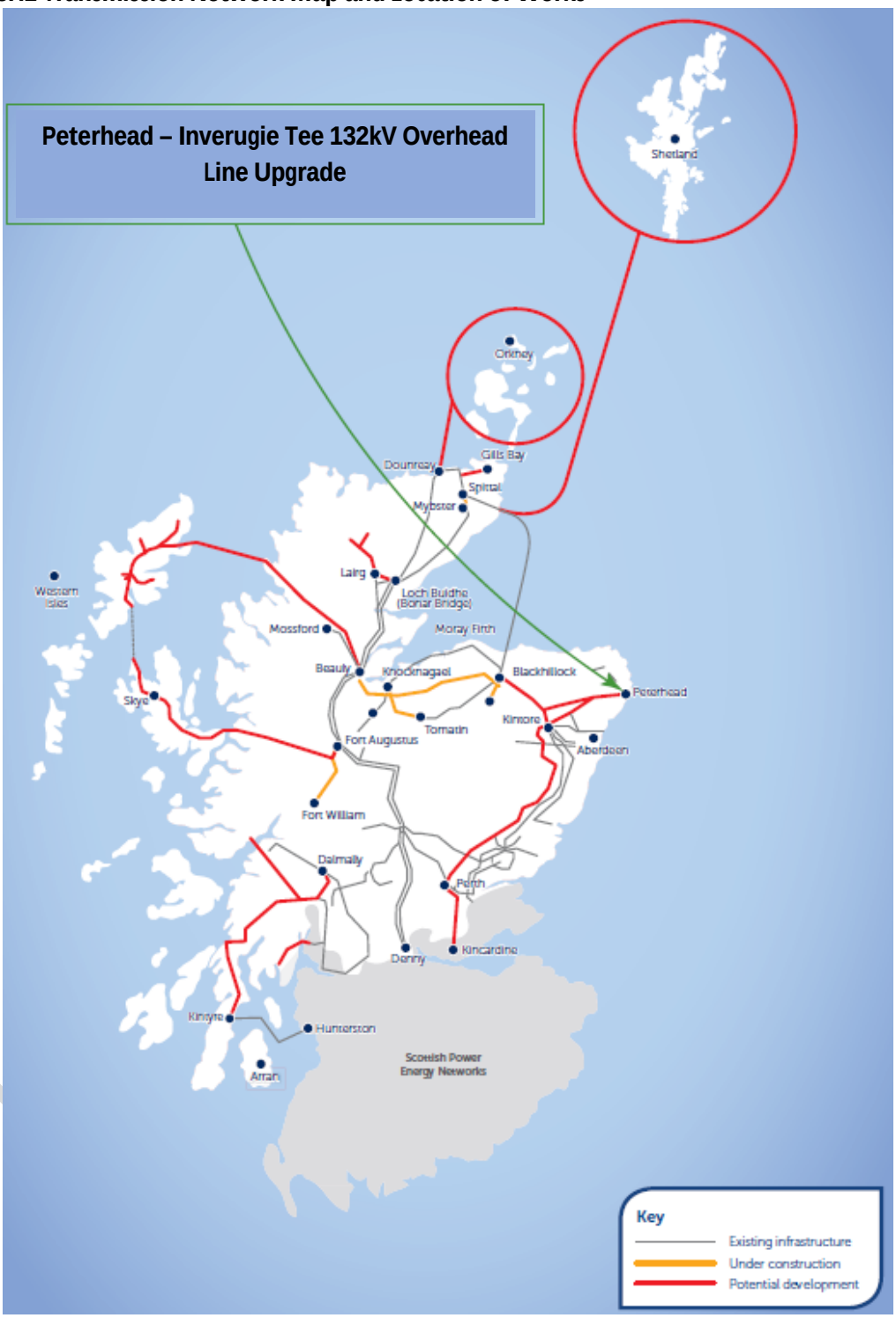
Section 7: Price Control Deliverables and Ring Fencing

This section provides a view of whether the proposed scheme should be ring-fenced or subject to other funding mechanisms.

Section 8: Outputs included in RIIO-T1 Business Plan

This section identifies if some or all the outputs were included in the RIIO-T1 Business Plan and provides explanation and justification as to why such outputs are planned to be undertaken in the RIIO-T2 period.

Figure 1: SHE Transmission Network Map and Location of Works



3 Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the need.

3.1 Background

[redacted]

Appendix A shows the 6.7km, 132kV double circuit OHL between Peterhead and the Inverugie Tee. This line comprises of twenty-four PL16 steel lattice towers, with six phase conductors supported from insulators on six crossarms with one earth wire located centrally at the top of this formation.

[redacted]

The Single Line Diagrams (SLD) in Appendices B and C show how the north east 132kV transmission network is electrically connected in the context of the wider transmission system.

A non-load project was completed on the OHL sections between St Fergus, Inverugie Tee and Peterhead Grange in October 2019. These works replaced the 175mm^2 Aluminium Conductor Steel Reinforced (ACSR) Lynx phase conductors with 300mm^2 All Aluminium Alloy UPAS Conductors and the 70mm^2 ACSR Horse earth wire with Keziah equivalent Optical Ground Wire (OPGW) conductor. The thermal capability of the new UPAS phase conductor operating at 75^{o}C constitutes an uplift in the Winter Post Fault rating of 91MVA per circuit (241MVA-150MVA).

The double circuit OHL between Peterhead and the Inverugie Tee was constructed in 1977 and is 6.7km in length. The circuit is strung with single 175mm^2 Aluminium Conductor Steel Reinforced (ACSR) Lynx phase conductors and has a 70mm^2 ACSR Horse earthwire conductor. This construction has a design operating temperature of 65^{o}C which constitutes a Winter Post Fault Rating of 150MVA (see Thermal Rating Schedules for the existing construction in Appendix C). The majority of the circuit

protection was upgraded with the construction of the St Fergus switching station, in 2009/10 meaning it is still well within its design life, and no performance issues have been identified. However, the check sync and voltage selection scheme on each circuit was not replaced at this time and requires replacement.

The circuit is built upon relatively flat arable farm land. There are seven major road crossings (A & B Class roads) and three spans which are in close proximity to industrial/farm buildings. There are no Sites of Specific Scientific Interest, Special Areas of Conservation, Special Protection Areas or Nature Reserves along the route of the circuit. There is a good road network in the area comprising of A and B class roads. Due to the nature, profile and designation of this land it is not envisaged that the environment will present any major issues to the project.

3.2 Asset Need

The network asset risk methodology is detailed in the Asset Management Strategy Paper, A Risk-Based approach to Asset Management[1]. In this case and in line with the recommendations in the Asset Condition Report. Non-Load related intervention is required during the RIIO T2 price control period on the Peterhead to Inverugie Tee 132kV OHL.

The Asset Condition Report[2] for the Peterhead to Inverugie Tee 132kV OHL documents the results of; the asset design life appraisal, line patrol survey (recorded in the SHE Transmission CyberHawk system), historic records and Cormon Testing. These results are used to inform recommendations for asset intervention.

The Peterhead to Inverugie Tee OHL was constructed in 1977, thus by the end of RIIO T2, both the phase and earth wire conductor will have been in service for 49 years. The industry mean asset service life is 54 years based upon 'normal' environment. If based in a 'heavily polluted' environment the mean service life is reduced to 46 years[3]. Based on its proximity to the coast, the Peterhead to Inverugie Tee OHL can be categorised as being situated in an 'heavily polluted' environment.

The line patrol survey carried out in April 2018 assessed the key components of the OHL including; Tower Steelwork, Fixtures & Fittings, Insulators, Conductor Components, Muffs and Stubs. The results show that the tower steelwork, fixtures and fittings (excluding u bolts and shackles) insulators and stubs are predominantly Grade 1 (No visible/quantifiable deterioration or damage) or Grade 2 (Apparent normal wear, intervention to be done in the next refurbishment).

The results of the most recent Cormon study established that the phase conductor was in good condition with only minor suggestions of corrosion picked up, however, the earthwire shows signs of significant corrosion.

[2] Peterhead – Inverugie 132kV Asset Condition Report T2BP-ACR-0022
[3] CIGRE- Report 176, Ageing of the system – Impact on planning (Dec 2000)

While the majority of the phase conductor insulators, dampers and arcing horns appear to be in relatively good condition, the condition of shackles and U-bolts appears to be consistently poor, triggering the need to replace a number of these components.

Earthwire assemblies on 13 of the 24 towers show signs of severe damage and require replacement.

The concrete stubs and muffs appear to be in poor condition, both structurally and coating, with six towers identified to have deteriorated or inaccessible muffs. Refurbishment of part or all of the route will be required as a minimum, with refurbishment of the whole route recommended to achieve a greater design life.

The fault records do not immediately point to any recurring issues throughout this OHL or damage caused by weather or fault conditions.

In addition to the short-term maintenance requirements to address the component issues discussed above, the Asset Condition Report[2] recommends that following works are completed during the RIIO T2 price control period:

- Steelwork members on all towers showing signs of surface rust are cleared of rust and painted;
- Fittings, including, dampers, shackles and u-bolts are replaced;
- The earthwire is replaced; and,
- Concrete muffs and stubs are refurbished along the line.

3.3 Growth Need

The current contracted generation background (Total Connected & Contracted 101MW) for the north east 132kV network is shown in Table 1 and the maximum 2018/19 group demand is 127MVA. The NETS SQSS Chapter 2, Generation Connections and Chapter 3 Demand Connection Criteria does not currently justify a project primarily based on load. However, it is prudent to consider the prospective future load capacity requirements when undertaking condition-based intervention on the transmission system.

As there are three circuits feeding the North East 132kV, it is required under the NETS SQSS to plan for two circuits being out of service (a planned outage followed by a fault outage) to determine both the thermal import and export capacity requirements for the group in line with the NETS SQSS. Based on the current generation and demand backgrounds, it is recommended that the replacement conductor, as a minimum, should equal the summer post fault capacity of the recently reconductored (2019) OHL between St Fergus and Peterhead Grange, 210MVA. This allows for both the generation and demand growth anticipated in this region which has been an area of customer interest for the connection of battery storage, wind and solar schemes.

Table 1: Connected & Contracted Generation

GSP	Transformers	Connected (MW)	Contracted (MW)	Total (MW)
Strichen	2x 90MVA, 132/33kV	44.76	3.20	47.96
Fraserburgh	2x 45MVA, 132/33kV	3.60	0.00	3.60
St Fergus Gas	2x 40MVA, 132/33kV	19.00	0.33	19.33
Peterhead Grange	2x 45MVA, 132/33kV	30.98	0.00	30.98
Total		98.33	3.53	101.86

It should be noted that following any reconductoring of the Peterhead to Inverugie Tee OHL, the circuit limiting the import/export of the north east 132kV group would be the 132kV single circuit between Peterhead and St Fergus which has a Summer Post Fault rating of 196MVA.

4 Optioneering

This section presents all the options considered to address the need that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for Detailed Analysis in Section 5.

The option to do nothing would mean that no intervention is undertaken on this OHL. This option has been discounted at this stage as the network asset risk and asset condition assessments have concluded a need to intervene and upgrade/replace assets.

Common to each intervention option is the requirement to coordinate the construction and outage programmes to interface with the proposed north east transmission upgrade projects planned during the RIIO T2 Period. This includes the non-load replacement of two 275/132kV, 240MVA SGTs at Peterhead Substation[4], the North East 400kV Upgrade[5] scheduled for completion in October 2023 and St Fergus Mobil.

Table 2: Table of Options

Option	Option Detail	Cost (£m)	Taken forward to Detailed Analysis?
1	Replace Earth Conductor and Fittings	5.9	Yes
2	Full refurbishment of existing circuit, reconductoring with UPAS conductor	10.3	Yes

Option 1 - Replace Earth Conductor and Fittings

Option 1 is the option that intervenes as recommended by the Peterhead to Inverugie Tee Asset Condition Report. This option includes:

- The replacement of earthwire assemblies;
- replacement of the existing 6.7km, 70mm^2 ACSR Horse earth wire with Keziah equivalent OPGW
- Earthing of those towers identified as often frequented.
- tower painting and repairing the Concrete Muffs; and,

[4] Peterhead 275/132kV, 240MVA Super Grid Transformer Replacement, RIIO T2 Engineering Justification Paper
[5] North East 400kV Upgrade RIIO T2 Engineering Justification Paper

- Following recent finite element analysis: ground works on ten spans, panel extensions on two spans and a new tower to mitigate the hot curve infringements.

Option 1 has the benefit of utilising the existing assets and route corridor whilst addressing the asset condition of key components of the double circuit OHL that necessitate intervention. This option maintains the condition & performance of the assets at the level required to maintain safe & secure operation of the network.

Option 1 is progressed to Detailed Analysis.

PROGRESSED TO DETAILED ANALYSIS

Option 2 - Full refurbishment of existing circuit, reconductoring with UPAS conductor

Option 2 is an option that seeks to bring forward works that could be completed beyond the RIIO T2 period and coordinate these with the asset intervention works identified by the Asset Condition Report as being required during RIIO T2.

The output of the design assessment identified Upas AAAC conductor as the preferred conductor for replacement, the considerations for this conductor choice are summarised below;

- Conductor assessment has taken a Lynx ACSR standard replacement as Upas AAAC. The replacement of ACSR conductors with AAAC is standard industry practice, as ACSR conductors are gradually being phased out by suppliers and are unlikely to be standard products in the years to come.
- The Upas AAAC conductor has been selected for the Lynx ACSR replacement as it has been used widely on the UK Network and meets the electrical and mechanical requirements of the OHL. As the Upas conductor is stronger than the Lynx conductor, the resulting works on the scheme will include tower and foundation strengthening as well as clearance infringements mitigation to ensure that minimum statutory clearances are met. Alternative, smaller, AAAC conductors were assessed which would achieve the required electrical rating, however were ruled out as the mechanic loading would exceed the limits specified by the suppliers.

As a result, this option proposes full reconductoring and refurbishment of the OHL consisting of;

- Reconductoring of the VS1/VS2 circuit with Upas AAAC.
- Replacement of the earthwire with Keziah OPGW.
- Strengthening of towers and foundation upgrades in line with latest design standards as required.

- Mitigation of ground clearance infringements as a result of reconductoring with Upas
- Replacement of all fittings including insulator sets
- Painting of all towers
- Earthing of those towers identified as often frequented.
- Repair and coating of all muffs
- Protection upgrades at remote ends for check sync and voltage selection

This option will re-utilise the existing asset and route however new access will be required to establish pulling positions for the new conductor.

The concurrent reconductoring of both phase and earth conductors presents potential benefits by reducing overall asset intervention costs by removing the requirement to re-mobilise and by reducing the cumulative weeks of construction outages.

Option 2 also presents the opportunity to reduce the exposure of operatives to a live network environment thus providing health and safety benefits through avoidance of additional work. Furthermore, the impact of the works to upgrade the network can be reduced through coordination of activities providing benefit to stakeholders and landowners through the reduction of potentially disruptive construction activities.

Option 2 is progressed to Detailed Analysis to determine if the efficiencies gained from advancing future works are economically justified.

PROGRESSED TO DETAILED ANALYSIS

5 Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgement contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

5.1 Cost Benefit Analysis

The options discussed in Section 4 of this paper are both considered as technically achievable and acceptable to address the asset heath of the Peterhead to Inverugie Tee 132kV double circuit OHL.

The purpose of progressing Options 1 and 2 to Cost Benefit Analysis is to determine whether there are economic and monetised risk benefits to undertaking investment ahead of need. The CBA has been used to quantify the monetary value of reconductoring the earth wire during the RIIO T2 period, returning at a later date to complete the condition-based phase reconductoring or alternatively completing the concurrent earth and phase reconductoring within the RIIO T2 period.

The results of the CBA are presented in Table 3 and conclude that Option 2, full refurbishment of existing circuit, reconductoring with Upas conductor, performs better than option 1.

Option 2 aligns with the works completed on the section of OHL between St Fergus and Peterhead Grange in RIIO T1 and thus completes the three ended circuit between Peterhead – St Fergus and Peterhead Grange using the same conductor technology.

Table 3: Cost Benefit Analysis Results

Option Reference	Description Of Options	Total Forecast Expenditure (£m)	Total NPV	Delta (Option to baseline)	Total NPV (Incl. Monetised Risk)
Option 1 (Baseline)	Replace Earth Conductor and Fittings	-£19.14	-£14.69		£631.82
Option 2	Full refurbishment of existing circuit, reconductoring with UPAS conductor	-£16.08	-£13.08	£1.61	£636.26

[redacted] A temporary diversion at the tee off point will be required to avoid any lengthy outages. This temporary diversion will be similar to the one used under the St Fergus – Peterhead 132kV OHL Refurbishment carried out in RIIO T1.

In line with the stakeholder feedback presented in A Risk Based Approach to Asset Management, bringing forward the phase conductor replacement works to align with the RIIO T2 earth wire replacement is demonstrated to be a cost-effective solution that brings value to stakeholders and consumers. The stakeholder benefits are centered around the reduction of SHE Transmission construction activity in the region, security of supply through the optimisation of construction outages and the reputational and safety aspects associated with only accessing the OHL structures once.

Based on the evidence presented in the Asset Condition Report, engineering assessments, consideration of future load requirements and CBA; the preferred solution is Option 2, full refurbishment of existing circuit, reconductoring with Upas conductor.

5.2 Project Sensitivity

As outlined in our core RIIO-T2 business plan document, "A Network for Net Zero", we believe we have a critical role to play in delivering Net Zero ambitions in both the UK and Scotland. Therefore, our plan has been carefully designed with the flexibility to deliver pathways to Net Zero. Our policy paper "A Risk-Based Approach to Asset Management" outlines our approach to monitoring and assessing the condition of our assets to maintain the reliable and resilient network that is expected by our stakeholders. Where asset condition deteriorates, we undertake a programme of cost-effective, risk-based interventions to maintain the longevity and performance of the transmission network. Each of our non-load related projects for T2 is underpinned by Asset Condition Reports which clearly outline that the works are necessary and driven by reliability.

Table 6: Sensitivity Analysis table

Sensitivity	Test and impact observed – switching inputs
Asset Performance / deterioration rates	Switching deterioration assumption: The asset performance / deterioration rates can only improve or deteriorate. As the need for this project is driven by an asset condition report (as outlined in Section 3), the asset condition will not improve in the intervening period. The second option is for the asset performance to deteriorate and therefore the need remains, and the project would be considered for advancement within available outages.
Ongoing efficiency assumptions	Switching efficiency assumption: increased or decreased. Test would have no impact on (feasible)

	option selection, the options move in parallel and have no impact on ordering within CBA.
Demand variations	No significant demand forecast
Energy scenarios	Sensitivity considered in Section 3 (Need) already. As this is a non-load project and the need is driven by the asset condition, the work would be required regardless of any changes to the energy scenarios.
Asset utilisation	Our policy paper "A Risk-Based Approach to Asset Management" outlines our approach to monitoring and assessing the condition of our assets to maintain the reliable and resilient network that is expected by our stakeholders. Where asset condition deteriorates, we undertake a programme of cost-effective, risk-based interventions to maintain the longevity and performance of the transmission network. Each of our non-load related projects for T2 is underpinned by Asset Condition Reports which clearly outline that the works are necessary and driven for reliability.
Timing / delivery	We have considered timing of investments as part of our CBAs.
Consenting / stakeholders	Where applicable we have considered consenting and stakeholder engagement as part of section 5 (Detailed Analysis) and the impact which this has had on the selection of the preferred solution.
Public policy / Government legislation	We have considered the impact of public policy, government legislation and regulations as part of the need (section 3), optioneering (section 4) and detailed analysis (section 5) and the impacts this has on the selection of the preferred solution. For example, the projects have considered the impact of the UK Governments' Net Zero emission by 2050 target, SQSS and ESQCR.

5.3 Proposed solution

Option 2 includes the full refurbishment of the double circuit OHL and the concurrent reconductoring of the Earth and Phase Conductors.

- Reconductor 6.7km of existing 70mm^2 ACSR Horse earth wire with a Keziah equivalent Optical Phase Ground Wire (OPGW)
- Reconductor 6.7km of existing 175mm^2 Aluminium Conductor Steel Reinforced (ACSR) Lynx phase conductors with 300mm^2 All Aluminium Alloy Upas Conductors
- Tower painting
- Strengthening of towers and foundation upgrades in line with latest design standards
- Replacement of all fittings including insulator sets
- Mitigate ground clearance infringements identified from the replacement conductor type.
- Protection modifications at remote ends for check sync and voltage selection

Table 3: Outputs from Preferred Solution

Plant	Size of new plant	Replacement for
132kV overhead line	6.7km Upas AAAC 6.7km Keziah OPGW	6.7km Lynx ACSR 6.7km Horse ACSR earthwire

The works will be undertaken during the RIIO T2 period delivering an OHL asset that will maintain safe & secure operation for the north east 132kV network fed from Peterhead Substation.

5.4 Competition

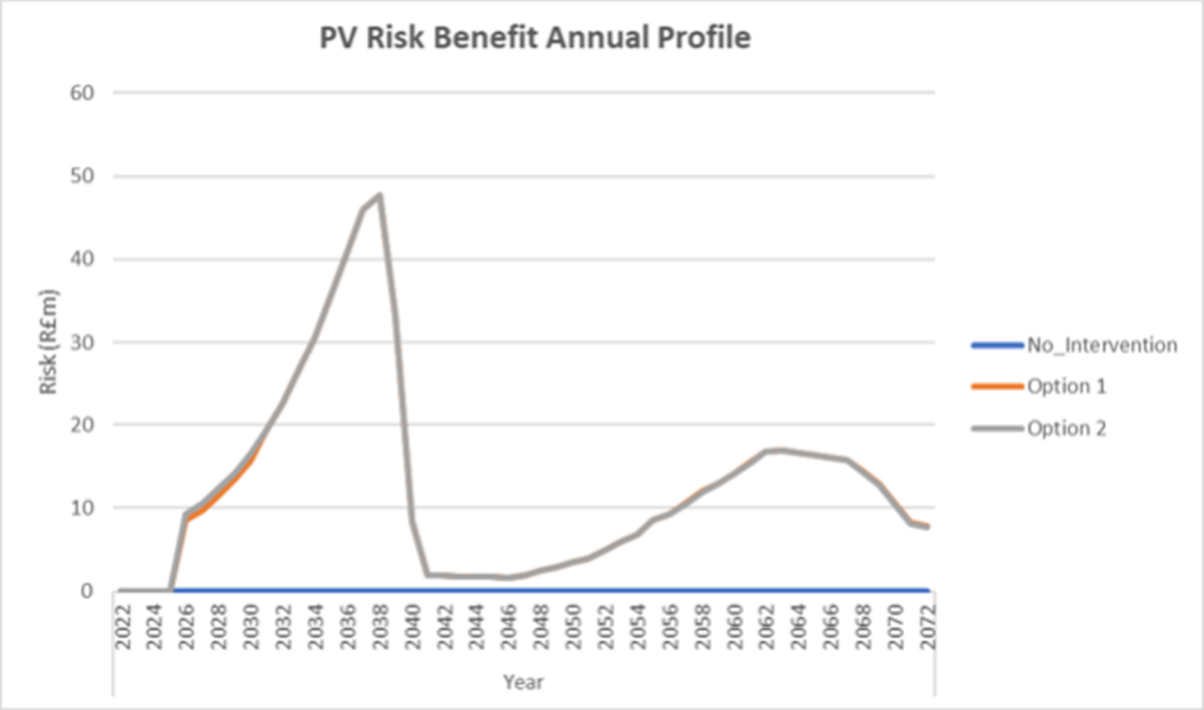
The Peterhead – Inverugie Tee scheme is not flagged as eligible for early or late competition due it being under Ofgem's £50m and £100m thresholds respectively.

5.5 Risk Benefit

A Risk Benefit Analysis has been carried out in order to compare "no intervention" against the selected "with intervention" option. Please note that while monetised risk is denoted as a financial figure, it is important to note that it is not "real" money and does not correspond to the cost that SHE Transmission would incur if an asset was to fail and these values are thus identified with R£ prefix (for more details please refer to A Risk Based Approach to Asset Management1).

The long-term monetised benefit which would be realised through the completion of this project is R£1388.8m. The long-term benefit is derived by consideration of the risk of the asset experiencing a catastrophic failure weighted by the probability that the asset will survive for the Options and "no intervention" scenarios. The long-term benefit is an aggregation of the risk of all assets being considered within the option. The risk of each Option is then compared with the "no intervention" scenario. The "no intervention" scenario assumes that when the asset experiences a catastrophic failure the asset is replaced.

Figure 3 - Long Term Benefit of Proposed Intervention – Option 2: Full Refurbishment



In addition to assessing the long-term risk benefit, a monetised risk benefit has also been determined. The monetised risk benefit which would be realised through the completion of this project is R£6.7m.

5.6 Carbon Modelling

We are committed to managing resources over the whole asset lifecycle – i.e. including the manufacturing of assets, construction, operations and decommissioning activities – to reduce our greenhouse gas emissions in line with climate science and become a climate resilient business. It is our aspiration that the carbon lifecycle cost of investment options plays a key role within our project development and is considered in the selection of a preferred solution. We have therefore developed an internal carbon pricing model that estimates a carbon cost for each option considered in our CBA through deriving values for:

1. Embodied carbon, which relates to the carbon emissions associated with the manufacturing and production of the materials use in production of the lead assets (transformer, reactors, underground cables and overhead lines. Overhead line is made up of tower/wood pole/composite pole, conductor and fittings) procured and installed as part of the project.
2. The carbon emissions associated with the main stages of the project lifecycle (construction, operations and decommissioning).

It is our vision to embed carbon considerations within our strategic optioneering and project development processes, which will require us to determine a way of flagging high carbon options within our CBA outputs. We will continue to develop our thinking in this space, which will involve our model being validated by a third party, so the results included in this EJP are indicative and subject to change.

In terms of the results of analysis for this project, which are captured in the carbon footprint results table,

1) Option 1 is the option that delivers the lowest comparative carbon footprint, due to the lesser scope of work over option 2.
2) Option 2 is the preferred option as the CBA as well as engineering judgement and stakeholder feedback support the earlier intervention to replace the phase conductors.

Table 7: Carbon Calculation Summary

	Project Information	Baseline	Option
Project info	Project Name/number	Option1	Option2
	Construction Start Year	2026	2026
	Construction End Year	2028	2028
Cost estimate £GBP	Embedded carbon	£ 26,664	£ 39,390
	Construction	£ 53,828	£ 62,977
	Operations	£ -	£ 361
	Decommissioning	£ 24,644	£ 28,833
	Total Project Carbon Cost Estimate	**£ 105,135**	**£ 131,562**
Carbon footprint tCO2e	Embedded carbon	356	526
	Construction	708	828
	Operations	-	2
	Decommissioning	71	83
	Total Project Carbon (tCO2e)	**1,135**	**1,439**
		£ 26,664	£ 39,390
	Total Scope 1 (tCO2e)	£ 53,828	£ 62,977

Project Carbon Footprint by Emission Category	Total Scope 2 (tCO2e)	£ -	£ 361
	Total Scope 3 (tCO2e)	£ 24,644	£ 28,833
		£ 105,135	**£ 131,562**
SF^6 Emissions	Total SF^6 Emissions 3 (tCO2e)		

5.7 Cost Estimate

The cost of the preferred option for works on the Peterhead – Inverugie Tee 132kV OHL has been developed using rates from existing substation framework contracts and benchmarks from delivered RIIO-T1 projects. The total cost for delivering the scope of works for the proposed solution is £10.3m.

6 Conclusion

This Engineering Justification Paper confirms the need for asset intervention on the Peterhead to Inverugie Tee 132kV OHL during the RIIO T2 price control period. The primary driver for the scheme is the asset condition.

Based on the consideration of stakeholder feedback, CBA and the optimised delivery strategy; the preferred option is Option 2: full refurbishment of the double circuit OHL and the concurrent reconductoring of the earth and phase conductors.

Selected option scope;

- Reconductor 6.7km of existing 70mm^2 ACSR Horse earth wire with Keziah equivilant Optical Ground Wire (OPGW) conductor;
- Reconductor 6.7km of existing 175mm^2 Aluminium Conductor Steel Reinforced (ACSR) Lynx phase conductors with 300mm^2 All Aluminium Alloy Upas Conductors;
- Tower painting, tower strengthening and repairing Concrete Muffs;
- Mitigation works including ground works, panel extensions and a new tower to mitigate clearance infringements as identified.

This scheme will cost £10.3m and will deliver the following outputs and benefits during the RIIO T2 period:

- A long term monetised risk benefit of R£1388.8m;
- A reduction of total network risk calculated as R£6.7m; and ,
- Improved operational flexibility and resilience in line with our goal to aim for 100% transmission network reliability for homes and businesses.

The Peterhead – Inverugie Tee 132kV OHL scheme is not flagged as eligible for early or late competition due it being under Ofgem's £50m and £100m thresholds respectively.

7 Price Control Deliverables and Ring Fencing

As set out in our Regulatory Framework paper (section 1.12 and Appendix 3) we support a key principle from Citizens Advice – one that guarantees delivery of outcomes equivalent to the funding received - to ensure that RIIO-T2 really deliver for consumers.

For our core non-load projects this means that we commit to delivering our overarching NARMs target. If we do not deliver the NARMS target, or a materially equivalent target, then we should be subject to a penalty. Equally, if we over-deliver against our target and are able to justify that the over-delivery is in the consumers interests and could not have been reasonably factored into our business plan at the time of target setting then we should be made cost neutral for this work.

Core non load projects should not be ring fenced. This is to allow for substitution of projects in order to meet that NARMs target. We need flexibility to respond to up to date asset data information or external influences on our network during the price control; this information might drive us to substitute one project for another in order to ensure a reliable and resilient network. Ring fencing projects may result in sub-optimal decisions, having adverse consequences for the health of our network, which will ultimately be reflected in the NARMs target.

8 Outputs included in RIIO-T1 Plans

There are no outputs associated with this scheme included in our RIIO-T1 plans.

Appendices

Appendix A: Peterhead - Inverugie Tee - Peterhead Grange - St Fergus 132kV Network

CONTENT DELETED

Appendix B: North East 132kV Network and East Coast MITS

CONTENT DELETED

Appendix C: North East 132kV Single Line Diagram

CONTENT DELETED

Appendix D: Peterhead to Inverugie Tee Thermal Rating Schedule

Circuit Thermal Overload Ratings for 132kV, 1x175mm² Lynx ACSR

O/H Circuit ID – VS1 (T-off from main line to Peterhead)

Rated Temperature: 65ºC

ALL RATINGS ARE PER CIRCUIT	Winter		Spring / Autumn		Summer	
	Amps	MVA	Amps	MVA	Amps	MVA
Pre-Fault Continuous	555	126	520	119	470	108
Post-Fault Continuous	660	150	620	142	560	128

Circuit Thermal Overload Ratings for 132kV, 1x175mm² Lynx ACSR

O/H Circuit ID – VS2 (T-off from main line to Peterhead)

Rated Temperature: 65ºC

ALL RATINGS ARE PER CIRCUIT	Winter		Spring / Autumn		Summer	
	Amps	MVA	Amps	MVA	Amps	MVA
Pre-Fault Continuous	555	126	520	119	470	108
Post-Fault Continuous	660	150	620	142	560	128

Circuit Thermal Overload Ratings for 132 kV, 1 x 325 mm² Oslo ACCC with Restricted Continuous ratings

O/H Circuit ID – VS3 (Peterhead-St Fergus)

ALL RATINGS ARE PER CIRCUIT	Winter		Spring / Autumn		Summer	
	Amps	MVA	Amps	MVA	Amps	MVA
Pre-Fault Continuous	821	186	786	178	725	164
Post-Fault Continuous	978	222	936	212	863	196