CABLE MAJOR REFURBISHMENT PROGRAMME	
Name of Scheme/Programme	SPNLT2021: Braehead Park – Erskine 132kV Cable Major Refurbishment. SPNLT2022: Galashiels – Hawick 132kV Cable Major Refurbishment. SPNLT2023: Portobello – Shrubhill 275kV Cable Major Refurbishment.
Primary Investment Driver	Asset Health
Scheme reference/ mechanism or category	SPNLT2021/Cable SPNLT2022/Cable SPNLT2023/Cable
Output references/type	NLRT2SP2021/Cable NLRT2SP2022/Cable NLRT2SP2023/Cable
Cost	SPNLT2021: £5.0M SPNLT2022: £2.3M SPNLT2023: £4.7M
Delivery Year	2022 – 2026
Reporting Table	C0.7/C2.2a_AP/C2.2a_CI/C2.3/C2.4b/C2.5/C2.5a
Outputs included in RIIO T1 Business Plan	No

Issue Date	Issue No	Amendment Details
July 2019	Issue 1	First issue of document
December 2019	Issue 2	Gross cost, NPV, Monetised Risk, Long Term Risk Benefit and Delivery Year values updated.

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1. Introduction

This paper supports a proposal to carry out a major refurbishment programme whose interventions include the replacement of hydraulic equipment (tanks, gauges, test slide values, pipe insulators and feed pipes) at terminations, re-engineering of pressuring system, joint bay excavation (joint plumb reinforcement, oil leak monitoring pipes, bunding and contamination removal within joint bay) and refurbishment of the earthing system.

The principal drivers for the major refurbishment of underground cables are safety, network security, public safety, environment, condition and compliance with relevant legislation.

Strategic objectives are defined for the management of fluid filled cables based on:

- Effective risk management of fluid loss from cable systems.
- Ensure security of the Transmission Network.
- Set the criteria for priority of refurbishment.

Reliability, public safety and the environment of installed fluid filled cables within the Transmission Network are the main aspects within the proposed programme:

- Environmental operating code for the management of Fluid Filled Cable System to reduce leakage rates employing best available techniques.
- Fluid filled cables are designed to operate at maximum capacity for a period of 40 years. As the majority of cables are not operated at full load for their entire lifetime then it is expected that the life expectancy would exceed this 40 year period.

Whilst the majority of fluid filled cables have not failed electrically, it is recognised the need for the reduction of oil leakage across the SPEN Transmission Network which is further compounded where circuits are located in environmentally sensitive areas and areas of restricted access.

The cable condition can be determined from leak and repair history and diagnostic evidence on the cable fluid condition. Cable accessories such as joints, terminations, tanks/pipe, SVLs, bonding cable and link boxes can all usually be replaced or refurbished to a serviceable condition. However, crystalline or porous lead or aluminium sheath is irreparable and is usually not a localised condition making the cable system replacement the only practicable investment option.

SP Energy Networks (SPEN) Cable System inspection strategy in conjunction with route specific investigations including cable sheath test, link box inspections and fluid analysis have been employed to provide a detailed condition analysis rating of the Cable System components.

Information gathered from the survey investigations for each cable system component is translated into component condition ratings from 1 to 5 upon its known condition, deterioration pattern, location and service history. The resultant condition rating value is subsequently input to the Condition Based Risk Management (CBRM) tool to identify its risk and criticality for the prioritisation of Cable System component interventions.

The following cable routes and level of interventions are included within this programme:

1.1 Braehead Park – Erskine 132kV Cable System

It is proposed to carry out a major refurbishment programme whose interventions include the replacement of hydraulic equipment (tanks, gauges, test slide values, pipe insulators and feed pipes) at terminations, re-engineering of pressuring system, joint bay excavation (joint plumb reinforcement, oil leak monitoring pipes, bunding and contamination removal within joint bay) and refurbishment of the earthing system.

In line with above, the proposed 132kV outputs to be delivered are:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
132kV UG Cable (Oil)	Refurbishment Major	-	11.3 cct. Km

1.2 Galashiels – Hawick 132kV Cable System

It is proposed to carry out a major refurbishment programme whose interventions include the replacement of hydraulic equipment (tanks, gauges, test slide values, pipe insulators and feed pipes) at terminations, re-engineering of pressuring system, joint bay excavation (joint plumb reinforcement, oil leak monitoring pipes, bunding and contamination removal within joint bay) and refurbishment of the earthing system.

In line with above, the proposed 132kV outputs to be delivered are:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
132kV UG Cable (Oil)	Refurbishment Major	-	2.9 cct. Km

1.3 Portobello – Shrubhill 275kV Cable System

It is proposed to carry out a major refurbishment programme whose interventions include the replacement of hydraulic equipment (tanks, gauges, test slide values, pipe insulators and feed pipes) at terminations, re-engineering of pressuring system, joint bay excavation (joint plumb reinforcement, oil leak monitoring pipes, bunding and contamination removal within joint bay) and refurbishment of the earthing system.

In line with above, the proposed 275kV outputs to be delivered are:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
275kV UG Cable (Oil)	Refurbishment Major	-	9.0 cct. Km

2. Background Information

2.1 Braehead Park – Erskine 132kV Cable System

Braehead – Erskine No 1 circuit:

It is a transition circuit consisting of both XLPE and fluid filled cable sections running through both urban and rural areas. The circuit has been modified over the years so that there is currently an assortment of manufacturers and cable types deployed. Some maintenance work has been carried out over the last few years with the installation of the Drallim remote monitoring system at the Blockhouse and Kirklandneuk kiosk.

- **Cable type:** fluid filled to XLPE transition circuit to fluid filled:
    - Braehead Park S/S – Blythswood: fluid filled – lead sheath 1950.
    - Blythswood – Kirklandneuk: XLPE 2013.
    - Kirklandneuk – Red Smiddy (Tower BZ014): fluid filled-lead sheath 1945.
- **Earthing system:** solid bonded at transition and midpoint link box XLPE section. At jointing positions of fluid filled cable sections the cable sheaths are solidly bonded.
- **Route description:** part of the cable route runs through Renfrew town centre and other parts cross agricultural land to the rear of Glasgow airport and underneath the White Cart Water. A section of the cable route runs through Glasgow airport land itself and notice is required to the airport for any works in or around the airport perimeter.

Note: if the circuit was to fault within the Airport area access would be restricted as the circuit is installed at the end of the main runway.

Braehead – Erskine No 2 circuit:

It is a fluid filled circuit running through both urban and rural areas. The circuit has been the subject of some maintenance over the last few years with the repair of a stop joint plumb on Old Greenock Road and a leak repair at Tower BZ15.

- **Cable type:** fluid filled (1965) – Al sheath.
- **Earthing system:** cross bonded.
- **Route description:** sections of the cable route runs through Renfrew town centre and other sections run adjacent to the A8 Old Greenock Road through agricultural land.

Double circuit route between towers BZ019-020:

Both circuits pass underneath the adjacent 275kV OHL. The last recorded test and inspection for both circuits was in 1988. Both circuits are fluid filled and run from one sealing end platform to another over a length of approximately 200m. There is a gantry mounted link box at Tower BZ019 and a buried link box, tanks and gauge pit at BZ020. The circuit recently had some maintenance completed in 2017 with the installation of a Drallim remote monitoring system along with the gauges refurbished and calibrated.

- **Cable type:** fluid filled (1972).
- **Earthing system:** solid bonded.
- **Route description:** cable route passes underneath adjacent to XF 275kV OHL located in an agricultural grazing field.

Data Collection / Data Analysis / Interpretation

Braehead – Erskine No 1 circuit:

Visual inspection and condition information gathered in 2018 revealed that the equipment in the substation would require work to seal concrete and refurbish the gauges to improve their lifespan. Additionally, due to the age and condition of the equipment at Red Smiddy Compound, a full asbestos survey and removal of identified substances is required before any refurbishment work could commence.

In addition to the above, it was highlighted the need for flushing of fluid filled sections to replace fluid identified as not meeting circuit specification, repair of armoured pipe leak at Braehead Substation, replacement of all wooden cleats on CSE structures at Braehead Substation and Red Smiddy Compound along with plumb reinforcement on the fluid filled terminations, refurbishment of sealing end structures and tanks which are exhibiting signs of corrosion and require work to prevent any further deterioration, refurbishment of oil gauges and pipework at Red Smiddy Compound and Braehead Substation and the replacement of two underground link boxes at Craigielea Road and Blythswood Compound.

Figure 1: General condition of gauge and pipework at Red Smiddy compound.

Figure 2: Fluid tank at Braehead compound showing sign of rust.

Braehead – Erskine No 2 circuit:

Visual inspection and condition information gathered in 2018 revealed that the equipment in the substation would require work to seal concrete and refurbish the gauges to improve their lifespan. Additionally, immediate attention was required to the timber cleats as a number of these are either missing, broken or showing signs of rot. Link box chambers along the route are in various states of repair with the link box at Greenock Road stop joint starting to crumble and some of the concrete covers no longer sealing the chambers from the elements.

In addition to the above, electrically the circuit is in very poor condition particularly the section along Greenock Road. Most link boxes have water ingress. The link box at BZ15 is in very poor condition as it was found to have link missing and flooded. Gauges inspected at Greenock Road and Braehead Park was found to be working generally, however could benefit from refurbishment.

Figure 3: condition of link box at BZ015.

Figure 4: condition of Greenock road stop joint gauge.

Double circuit route between towers BZ019-020:

Visual inspection and condition information gathered in 2018 revealed the need for the refurbishment of link boxes since a sheath test on the No 2 circuit failed due to the presence of water in the link boxes.

CBRM Summary

CBRM extract is shown below indicating End of Life (EoL) for each of the identified asset for refurbishment:

Asset Description	Year of Installation	EoL*	Monetised Risk (R£m)*
132kV UG Cable (Oil)	1945/1950/1965/1972	8.6	6,225,850.67

**Values at the end of the RIIO-T2 period with no intervention as per NOMs methodology.*

2.2 Galashiels – Hawick 132kV Cable System

Galashiels – Hawick A and B circuits:

- **Cable type:** 3 core 300mm2 Cu fluid filled corrugated aluminium sheath (1965).
- **Earthing system:** solid bonded.
- **Route description:** cable route runs between Lowood Mains and Broomilees compounds through a wooded area at the vicinity of a housing development. At Lowood Mains the access is via a public recreation area with no vehicle access. At Broomilees the compound is accessed off the A6091 road. This is a national speed limit road with no parking. Vehicle access is limited to either 4x4 or tracked machines. Prior to accessing site the Local Authority should be notified to allow traffic management to be set up for access and egress to site.

Data Collection / Data Analysis / Interpretation

Visual inspection and condition information gathered in 2018 revealed that the access at both compounds needs to be reviewed to allow planned/emergency works. The circuit passed the cable sheath test at 5kV, this indicates that the aluminium sheath is fully protected by the outer sheath of the cable.

It was also revealed a need for replacement of all wooden cleats, post insulator and rubber feet on oil tanks, aluminium cleats on oil feed pipe to avoid sheath damage. Sealing end structures and tanks are showing signs of corrosion and require replacement to prevent any further deterioration. Red phase termination has a chip on the porcelain insulator which will require an epoxy repair. Holding down bolts on terminations are heavily corroded requiring to be changed out.

In addition to the above, final oil tests highlighted the need for flushing of fluid filled.

Figure 5: tanks starting to show signs of corrosion on lids and bases.

Figure 6: link box corroded.

CBRM Summary

CBRM extract is shown below indicating End of Life (EoL) for each of the identified asset for replacement:

Asset Description	Year of Installation	EoL*	Monetised Risk (R£m)*
132kV UG Cable (Oil)	1965	10.17	1,793,870.28

**Values at the end of the RIIO-T2 period with no intervention as per NOMs methodology.*

2.3 Portobello – Shrubhill 275kV Cable System

Portobello – Shrubhill No 1:

- **Cable type:**
  - Portobello S/S to Dryden Street: 3x275kV Single Core 0.75sq inch Oil Filled, copper conductor, carbon paper, corrugated aluminium sheath (1969).
  - Dryden Street to Shrubhill S/S: 3x275kV Single Core 0.50sq inch Oil Filled, copper conductor, carbon paper, corrugated aluminium sheath (1969).
- **Earthing system:** two complete cross bonded sections and single point are formed, with unbonded joints at one position. At both ends of the route, sealing ends have been earthed via disconnecting link boxes, Type LB2 with 0.35sq inch PVC insulated bonding leads.
- **Route description:** the cable route has been installed along and across some of Edinburgh's main highway routes in/out of the city.

Data Collection / Data Analysis / Interpretation

Visual inspection and condition information gathered in 2018 revealed the need for replacement of all plinth mounted tanks, old terminal connections at oil tank positions, all existing oil lines with new armoured oil lines and old oil tanks and gauges and alarms. In addition, the replacement of existing CCPU's with new SVL units at all link boxes along with an assessment of link boxes positions and the re-siting to more accessible locations to be considered.

The historical records of the circuit reveal the following cable system issues:

- Portobello S/S: sheath fault on all phases where bonding cable pass through C.T.
- Joint Bay 1/2: sheath fault repair at red phase/section 2.
- Section 5: oil leak repair.
- Section 5: sheath fault repair at blue phase.
- Joint Bay 5/6: link box re-positioned. Concentric joints installed.
- Joint Bay 5/6: oil leak repair carried out on Yellow phase joint.

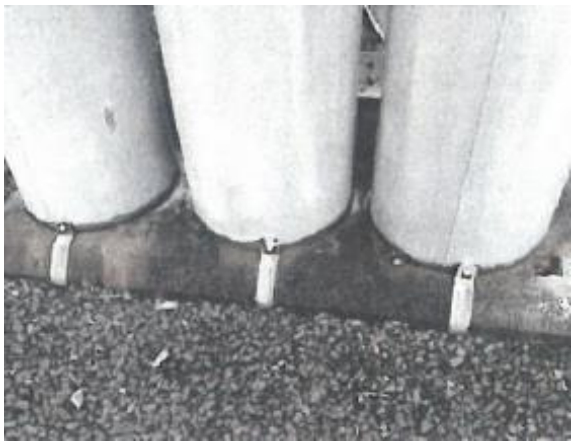

Figure 7: tanks showing signs of corrosion on bases.

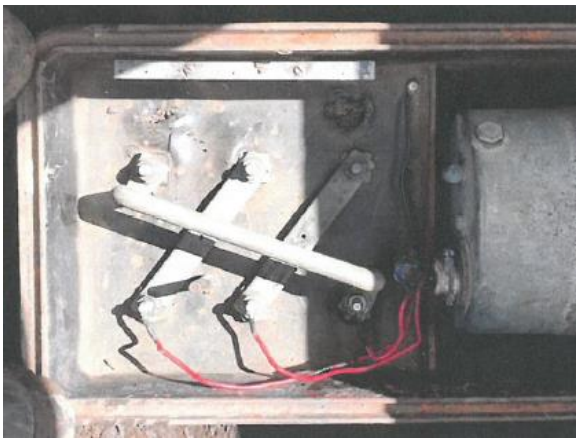

Figure 8: typical link box. Compound blistering.

Portobello – Shrubhill No 2:

- **Cable type:**
  - Portobello S/S to Dryden Street: 3x275kV Single Core 0.75sq inch Oil Filled, copper conductor, carbon paper, Lead alloy sheath, bronze tapes reinforcement (1969).
  - Dryden Street to Shrubhill S/S: 3x275kV Single Core 0.50sq inch Oil Filled, copper conductor, carbon paper, Lead alloy sheath, bronze tapes reinforcement (1969).
- **Earthing system:** two complete cross bonded sections and single point are formed with unbonded joints at one position. At both ends of the route, sealing ends have been earthed via disconnecting link boxes; Type LB2 with 0.35sq inch PVC insulated bonding leads.
- **Route description:** the cable route has been installed along and across some of Edinburgh's main highway routes in/out of the city.

Data Collection / Data Analysis / Interpretation

Visual inspection and condition information gathered in 2018 revealed the need for replacement of all plinth mounted tanks, old terminal connections at oil tank positions, all existing oil lines with new armoured oil lines and old oil tanks, gauges and alarms. In addition, the replacement of existing CCPU's with new SVL units at all link boxes along with an assessment of link boxes positions and the re-siting to more accessible locations to be considered.

The historical records of the circuit reveal the following cable system issues:

- Portobello S/S: sheath fault on all phases where bonding cable pass through C.T.
- Section 3: sheath fault repair at blue phase.
- Joint Bay 3/4: sheath fault repairs on yellow phase and concentric cables.
- Joint Bay 3/4: sheath fault repairs on blue phase concentric cables.
- Joint Bay 3/4: repair joint of blue phase stop joint.
- Joint Bay 4/5: third party damage and copper sleeve fitted to blue phase.
- Joint Bay 5/6: link box re-positioned and concentric joints installed.

Figure 9: typical link box. Compound blistering and signs of water ingress.

Figure 10: tanks showing signs of corrosion on bases.

CBRM Summary

CBRM extract is shown below indicating End of Life (EoL) for each of the identified asset for replacement:

Asset Description	Year of Installation	EoL*	Monetised Risk (R£m)*
275kV UG Cable (Oil)	1969	8.26	29,308,074.11

**Values at the end of the RIIO-T2 period with no intervention as per NOMs methodology.*

3. Optioneering

Three options have been considered based on the requirements identified within the condition assessments produced for each of the existing cable routes highlighted within the document. Option 1 has been recognised as the only viable option which meets the project objectives.

Option	Status	Reason for rejection
Baseline - Do Minimum: • Cable system refurbishment in RIIO-T3 (2031).	Considered	This option is not recommended due to the overall condition of the existing cable system and no intervention will add considerable risk to the SPT Network. In addition, deferring the investment will accelerate the continual deterioration of the cable system components. This will lead to a reduction in the expected life extension resulting from the refurbishment.
Option 1 - Major Refurbishment: • Cable system major refurbishment in RIIO-T2 (2026). • Cable system replacement beyond RIIO-T3.	Considered and Proposed	-
Option 2 – Cable Replacement • Cable system replacement in RIIO-T2 (2026).	Rejected	Replacement of the existing cable system in RIIO-T2 is not justified due to not having experienced signs of cable degradation. Full Replacement will incur in a more onerous cost and delivery timescales due to environmental planning constraints (which is not in the best interests of system security or consumers).

4. Detailed analysis

Option 1 achieves the main objective of refurbishing the cable systems in RIIO-T2 and thereby reducing the overall risks to the network and maximise the use of the asset. Both options, the deferral of the intervention to T3 and Option 1 have been considered for a Cost Benefit Analysis (CBA) for the Portobello – Shrubhill 275kV route. The deferral of the intervention to T3 result in reduced life extension as per the accelerated deterioration of the cable system components. The CBA has incorporated the total cost of both interventions as well as the long term risk benefit achieved by each of them during the assessment period.

4.1 Braehead Park – Erskine 132kV Cable System: Option 1 - Major Refurbishment

The following works shall form the basis of Option 1 intervention:

- Checking of existing data including new drawings, profiles and co-ordinates.
- Oil cable checks and circulation.
- Recalculation of all setting pressure alarms.
- Pre and post testing hydraulic and electrical (including PD).
- Re-engineering of pressuring system.
- Termination and refurbishment with a complete change out of all hydraulic equipment (tanks, gauges, test slide values, pipe insulators and feed pipes), cleating, base plate insulation and sheath earthing (incl voltage limiters) including all alarms.
- Joint bay excavation to check on joint condition, buried tanks/chambers and gauges, link boxes and chambers (including replacement of CPU's/SVLSs/frame and covers).
- Inclusion of future oil leak monitoring pipes, bunding and contamination removal within joint bay.
- Joint plumb reinforcement, cleating both ends of the joint, possible joint box removal, bond replacement and joint bay earthing.
- Inclusion of remote monitoring and tagging during oil circulation.
- Update all cable records to reflect the works carried out.
- Provide report to the Asset manager on the cable system condition.

<u>Specific factors attributable to this option which results in additional costs:</u>

- Potential for cable damage of due to work in close proximity.

<u>The following specific risks have been identified for this option:</u>

- Wayleave, environmental and local authorities' restrictions which impact on the progression of works as planned.
- Network access restrictions.

4.2 Galashiels – Hawick 132kV Cable System: Option 1 - Major Refurbishment

The following works shall form the basis of Option 1 intervention:

- Checking of existing data including new drawings, profiles and co-ordinates.
- Oil cable checks & circulation.
- Recalculation of all setting pressure alarms.
- Pre and Post testing Hydraulic & Electrical (including PD).
- Re-engineering of pressuring system.
- Review access to both compounds to allow planned/emergency works.
- Termination & refurbishment with a complete change out of all Hydraulic Equipment (tanks, gauges, test slide values, pipe insulators and feed pipes), cleating, base plate insulation and sheath earthing (incl voltage limiters) including all alarms.
- Joint bay excavation to check on joint condition, buried tanks/chambers & gauges, link boxes and chambers (including replacement of CPU's/SVLSs/frame and covers).
- Inclusion of future oil leak monitoring pipes and bunding and contamination removal within joint bay.
- Joint plumb reinforcement, cleating both ends of the joint, possible joint box removal, bond replacement and joint bay earthing.
- Inclusion of remote monitoring and tagging during oil circulation.
- Update all cable records to reflect the works carried out.
- Provide report to the Asset manager on the cable system condition.

Specific factors attributable to this option which results in additional costs:

- Damage of the cable due to be working in close proximity.

The following specific risks have been identified for this option:

- Wayleave, environmental and local authorities' restrictions which impact on the progression of works as planned.
- Network access restrictions.

4.3 Portobello – Shrubhill 275kV Cable System: Option 1 - Major Refurbishment

The following works shall form the basis of Option 1 intervention:

- Checking of existing data including new drawings, profiles and co-ordinates.
- Oil cable checks & circulation.
- Recalculation of all setting pressure alarms.
- Pre and Post testing Hydraulic & Electrical (including PD).
- Re-engineering of pressuring system.
- Termination & refurbishment with a complete change out of all Hydraulic Equipment (tanks, gauges, test slide values, pipe insulators and feed pipes), cleating, base plate insulation and sheath earthing (incl voltage limiters) including all alarms.
- Joint bay excavation to check on joint condition, buried tanks/chambers & gauges, link boxes and chambers (including replacement of CPU's/SVLSs/frame and covers).
- Inclusion of future oil leak monitoring, pipes and bunding and contamination removal within joint bay.
- Joint plumb reinforcement, cleating both ends of the joint, possible joint box removal, bond replacement and joint bay earthing.
- Inclusion of remote monitoring and tagging during oil circulation.
- Update all cable records to reflect the works carried out.
- Provide report to the Asset manager on the cable system condition.

Specific factors attributable to this option which results in additional costs:

- Damage of the cable due to be working in close proximity.

The following specific risks have been identified for this option:

- Wayleave, environmental and local authorities' restrictions which impact on the progression of works as planned.
- Network access restrictions.

4.4 Selected Option

CBA analysis has been developed for the "SPNLT2023 – Portobello – Shrubhill 275kV Cable Major Refurbishment" scheme and results extrapolated to the rest of the schemes within the "Cable Major Refurbishment Programme" since optioneering, interventions and investment cycles are common across the proposals.

Find below the Net Present Value of the options evaluated in the CBA:

SPNLT2023: Portobello – Shrubhill 275kV Cable Major Refurbishment				
Option No.	**Description Of Option**	**Preferred Option**	**Total NPV (£m)** *(Incl. Monetised Risk)*	**Delta** *(Option to baseline)*
Baseline	Baseline	N	£ 720.79	£ -
1	Major Refurbishment	Y	£ 794.57	£ 73.78

The best NPV over the full assessment period is for option 1, major refurbishment in the RIIO-T2 period.

5. Conclusion

The two options proposed have been reviewed in terms of scope feasibility, cost, timescales and construction risks with Option 1 demonstrating the primary objective of refurbishment the cable system whilst affording greatest reduction in risk to the network.

In line with the costs prepared, the proposed scope of works and CBA analysis, option 1 is the selected option:

5.1 Braehead Park – Erskine 132kV Cable System: Option 1 - Minor Refurbishment

- Scheme Total Cost: £5.0M
- Timing of investment: 2021 – 2024
- Declared outputs:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
132kV UG Cable (Oil)	Refurbishment Major	-	11.3 cct. Km

- Long term risk benefit (LR£m):

Asset Description	Long Term Risk Benefit (LR£m)
132kV UG Cable (Oil)	142.47

- Price control period of outputs: 2024

5.2 Galashiels – Hawick 132kV Cable System: Option 1 - Major Refurbishment

- Scheme Total Cost: £2.3M
- Timing of investment: 2021 – 2024
- Declared outputs:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
132kV UG Cable (Oil)	Refurbishment Major	-	2.9 cct. Km

- Long term risk benefit (LR£m):

Asset Description	Long Term Risk Benefit (LR£m)
132kV UG Cable (Oil)	27.44

- Price control period of outputs: 2024

5.3 Portobello – Shrubhill 275kV Cable System: Option 1 - Major Refurbishment

- Scheme Total Cost: £4.7M
- Timing of investment: 2020 – 2023
- Declared outputs:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/sets/each)
275kV UG Cable (Oil)	Refurbishment Major	-	9.0 cct. Km

- Long term risk benefit (LR£m):

Asset Description	Long Term Risk Benefit (LR£m)
275kV UG Cable (Oil)	549.25

- Price control period of outputs: 2023

6. FUTURE PATHWAYS – NET ZERO

6.1 Primary Economic Driver

The primary driver for this investment is asset condition and risk. The investment does not have a strong reliance on environmental benefits.

6.2 Payback Periods

The CBA indicates that a positive NPV results in all assessment periods (10, 20, 30 & 45 years) which is consistent with the lifetime of the intervention. Consumers benefit from reduced network risk immediately on completion of the project.

6.3 Pathways and End Points

The network capacity and capability that result from the proposed option has been tested against and has been found to be consistent with the network requirements determined from the ETYS and NOA processes. Additionally, the proposed option is consistent with the site-specific capacity requirements from SPT's Energy Scenarios.

6.4 Asset Stranding Risks

Electricity generation, demand and system transfers are forecast to increase under all scenarios. The stranding risk is therefore considered to be very low.

6.5 Sensitivity to Carbon Prices

The CBA inputs are not sensitive to carbon prices.

6.6 Future Asset Utilisation

It has been assessed that the preferred option is consistent with the future generation and demand scenarios and that the risk of stranding is very low.

6.7 Whole Systems Benefits

Whole system benefits have been considered as part of this proposal. The capacity and capability of the preferred option is consistent with the provision of whole system solutions.

7. OUTPUTS INCLUDED IN RIIO T1 PLANS

N/A