

**RIIO-T3 NLRE:
Pre-Construction
T2BP-PAP-0018**

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Introduction

This document provides further detail of the T3 Non-Load Related Expenditure (NLRE) schemes included within our Pre-Construction Methodology, ref T2BP-MET-0003. The total request in our plan is for 12 schemes totalling £13m baseline funding. Our proposal recognises there is a high level of uncertainty surrounding the scope and potential mix of schemes that we may need to develop in RIIO-T2 for delivery in the RIIO-T3 period and we have recognised this with the following regulatory controls:

- The expenditure for these schemes will be subject to symmetrical logging up at RIIO-T2 close out as described in our supporting paper – True Up, Logging Up and re-openers: SHE Transmission RIIO_T2 Proposals, ref T2BP-DD-SHE-010; and
- There will be opportunity to substitute schemes within this category based on changes in asset condition.

The schemes included within our baseline line proposal are summarised in the table below, with further scheme details outlined in the remainder of the document.

Summary table

Scheme	PCF Funding request
Clayhills Substation (SHNLT2048)	£0.909m
Woodhill Substation (SHNLT2054)	£0.975m
Persley Substation	£1.398m
Elgin Substation (SHNLT2049)	£0.975m
Inverness Substation (SHNLT2050)	£0.975m
Craigiebuckler to Woodhill CW1/CW3 Cable (SHNLT2055)	£1.625m
Dudhope Substation	£1.300m
Milton of Craigie Substation (SHNLT2052)	£0.975m
Charleston – Errochty OHL circuits	£1.703m
Lyndhurst Substation (SHNLT2051)	£0.942m
Dundee 132kV OHL circuits	£0.247m
Orrin Substation (SHNLT2053)	£0.975m
Total	£13.000m

Note: Based on the latest asset data available, we have replaced Beaully Shin, Strichen/Fraserburgh/St Fergus, and Nairn/ Keith, which were included within the December business plan with alternative schemes: Persley substation, Dudhope substation, Dundee OHL circuits, and Charleston – Errochty OHL circuits. Our proposal is now based on the schemes listed in the above summary table.

Scheme:	Clayhills Substation (SHNLT2048)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the Network Asset Risk Metric (NARM) methodology, Clayhills GT1 and GT3 have an End of Life (EoL) score of 8.52 and 8.92 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Clayhills GT1 and GT3 were manufactured in 1964 and by the end of T3 will be 67 years old and well in excess of their design life. The outdoor substation is in a high-risk location within Aberdeen city centre, adjacent to Aberdeen Train Station and in close proximity to residential flats on two sides. While there is a small amount of space within the substation, there is no option to extend the site.</p> <p>Both GT1 and GT3 have evidence of heavy corrosion – particularly the cooler banks and marshalling kiosks. This is consistent with experience at nearby Willowdale substation where sections of the grid transformer cooler banks have had to be removed because of corrosion. Oil results from both transformers also show low level acetylene trends and elevated acidity.</p> <p>Due to proximity to the coast, current design standards would require the substation to be located indoors. This case is further strengthened under Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR). This would make in-situ replacement challenging to safely and securely deliver. Complex substation redesign or an alternative site would therefore be required. The sourcing of an alternative city centre site, or addition of buildings within the confines of the existing site, will likely require a drawn-out planning application process to be undertaken. Therefore, it is essential that we undertake the necessary PCF works during the RIIO-T2 period so that we are ready to intervene on the scheme during the RIIO-T3 price control.</p> <p>The site is considered very high criticality under NARMs, as it is not possible to backfeed in excess of 1,000 customers at Clayhills under contingency plans.</p> <p>Due to the nature of the Aberdeen city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Aberdeen's security of supply is required.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Clayhills Substation was subject to a Pre-Construction Funding Request of £0.910m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p>	

Scope

The Transmission works required are as follows:

- Replace 2 Grid Transformers (GT1 and GT3) 30/60 MVA 132/33 kV, associated assets and civil works
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Clayhills 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2029 Completion
Project start	Q3 2025
Public Engagement	Q1 2026
Engineering and environmental studies complete	Q2 2026
Appoint contractor(s)	Q4 2026
Complete Initial contractor design	Q3 2027
Construction Start	Q1 2028
Energisation	Q1 2029

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Woodhill Substation (SHNLT2054)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Woodhill GT1 and GT3 have an EOL score of 8.27 and 7.2 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Woodhill GT1 and GT3 were manufactured in 1972 and by the end of T3 will be 59 years old and well in excess of their design life. The site is outdoor and in a high-risk location as it sits in an urban area of Aberdeen, adjacent to an ambulance depot and the headquarters of Aberdeen Council. The site is compact and shared with the Distribution Network Operator, Scottish Hydro Electric Power Distribution (SHEPD). There is no available space within the substation for an offline build and limited opportunities to extend the existing site.</p> <p>GT1 and GT3 cannot be replaced in-situ while meeting current design standards. The transformers are in very close proximity to each other with insufficient physical separation. Therefore, it is likely the site would need to expand or move. This will also have the potential to cause delays to allow for any planning application. Therefore, it is essential that we undertake the necessary PCF works during the RIIO-T2 period so that we are ready to intervene on the scheme during the RIIO-T3 price control.</p> <p>It is noted that, while current standards do not mandate the site to be indoors, it should still be considered due to its proximity to the coast.</p> <p>The site is considered very high criticality under NARMS, as the oil results for both transformers show raised 2-furfural concentrations which is indicative of paper insulation ageing.</p> <p>There are no HV transformer circuit breakers, so a fault on either GT would break the Aberdeen ring between Craigiebuckler and Willowdale.</p> <p>Due to the nature of the Aberdeen city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Aberdeen’s security of supply is required.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Woodhill Substation was subject to a Pre-Construction Funding Request of £0.975m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p>	

Scope

The Transmission works required are as follows:

- Replace 2 Grid Transformers (GT1 and GT3) 45/90 MVA 132/33 kV, associated assets and civil works
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Woodhill 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Persley Substation
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Persley SGT1 and SGT3 have an EOL score of 9.73 and 8.68 respectively by the end of RIIO-T3. Similarly, 132kV circuit breakers 120, 220 and 420 have EOL scores of 8.68, 8.77 and 8.77 respectively.</p> <p>Requirement and Driver(s)</p> <p>Persley SGT1 and SGT2 were manufactured in 1977 and by the end of T3 will be 54 years old. 120, 220 and 420 are the last remaining three oil filled circuit breakers at 132kV or above on the SHE Transmission network, manufactured in 1977 and so will be 54 years old by the end of T3.</p> <p>The substation is outdoor and currently considered to be in a medium-risk location under ESQCR, adjacent to a railway line and sports pitch. In addition, a large new housing estate is currently in construction in close proximity and with a known impact on site access. There is limited space within the existing substation boundary, and limited opportunity for expansion of the existing compound due to the steep slope and sports complex on either side of the compound. Under current design standards, consideration should be given to the site being indoors due to proximity to the coast. In addition, experience of broken glass and porcelain insulators at the substation indicate risk of vandalism and damage which may support this.</p> <p>The existing substation layout is unconventional and compact. Asset replacement in situ would not be acceptable under current design standards. High level assessment of the site indicates in situ replacement may also be impractical without excessive outages, requiring careful co-ordination across the network and with connected customers. Complex substation redesign or an alternative site would therefore likely be required. The sourcing of an additional or alternative site has the potential to cause delays in any planning applications.</p> <p>Oil results show an increasing acetylene trend in the main and selector tanks of SGT1 and an increasing hydrogen trend in two of the selector tanks of SGT2.</p> <p>Due to the nature of the Aberdeen city network arrangement and given that work is going to be required across the ring and the wider East and North East network, PCF to ensure an efficient, coordinated and whole system approach to improving Aberdeen’s security of supply is required.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Based on the latest asset data available, we have replaced Beaully Shin, Strichen/Fraserburgh/ St Fergus, and Nairn/ Keith, which were included within the December business plan with alternative schemes: Persley substation, Dudhope substation, Dundee OHL circuits, and Charleston – Errochty OHL circuits. We are requesting £1.398m of Pre-Construction Funding for Persley 275/132kV Substation. The funding</p>	

provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.

Scope

The Transmission works required are as follows:

- Replace 2 Supergrid Transformers (SGT1 and SGT2) 120/240 MVA 275/132 kV and associated assets and civil works
- Replace 3 132kV circuit breakers
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Persley 275/132 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, civil design and initial site works, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2029 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2029

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Elgin Substation (SHNLT2049)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Elgin GT1 and GT2 each have an EOL score of 9.17 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Elgin GT1 & GT2 were manufactured in 1971 and by the end of T3 will be 60 years old and well in excess of design life. The site is in a high-risk location under ESQCR as it is close to a new and expanding housing estate and public footpaths.</p> <p>GT1 and GT2 cannot be replaced in situ while meeting current design standards. GT1 and GT2 are located adjacent to each other and separated by a fire wall. Therefore, it is likely the site would need to expand as there is not enough space currently to undertake the necessary works. Planning applications for further housing developments in the vicinity of the substation have been made, limiting the possibility of expanding the footprint of the site. This will also have the potential to cause delays for any planning application.</p> <p>Both GT1 and GT2 have Operational Restrictions on their tap changers, requiring an exclusion zone. The GTs have also evidenced signs of excessive oil leaks and rusting.</p> <p>Elgin substation is the only Transmission substation for Elgin and is therefore an important part of the town’s infrastructure. It is not possible to backfeed in excess of 10,000 customers at Elgin under contingency plans.</p> <p>This site requires PCF as it is not a straightforward like for like replacement and will require some complex substation redesign to safely and efficiently deliver.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Elgin 132/33kV Substation was subject to a Pre-Construction Funding Request of £0.975m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p> <p>Scope</p> <p>The Transmission works required are as follows:</p> <ul style="list-style-type: none"> • Replace 2 Grid Transformers (GT1 and GT2) 45/90 MVA 132/33 kV, associated assets and civil works • Associated non-lead assets 	

- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Elgin 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Inverness Substation (SHNLT2050)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Inverness GT1 and GT2 have an EOL score of 9.25 and 9.91 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Inverness GT1 & GT2 were manufactured in 1972 and by the end of T3 will be 59 years old and well in excess of design life. The site is in a high-risk location under ESQCR as it is close to existing housing estates and new houses are currently being built adjacent to the substation.</p> <p>GT1 and GT2 cannot be replaced in situ while meeting current design standards. The transformers are in very close proximity to each other with insufficient physical separation or mitigation. In the event of a catastrophic failure, it is likely both GTs would be taken out of service as they are within the fire damage zones of each other. Therefore, it is likely the site would need to expand. There is a risk that the remaining land could be purchased for further housing related construction, limiting the ability to expand the footprint of the site if required. This will also have the potential to cause further delays for any planning application.</p> <p>Both GT1 and GT2 have Operational Restrictions on their tap changers, requiring an exclusion zone. GT1 and GT2 are also displaying signs of rust and leakage.</p> <p>Inverness substation is the only transmission substation for Inverness and is therefore an important part of the city’s infrastructure. It is considered very high criticality under NARMs. It is not possible to backfeed in excess of 10,000 customers at Inverness under contingency plans.</p> <p>This site requires PCF as it is not a straightforward like for like replacement and will require some complex substation redesign.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Inverness 132kV substation was subject to a Pre-Construction Funding Request of £0.975m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p> <p>Scope</p> <p>The Transmission works required are as follows:</p> <ul style="list-style-type: none"> • Replace 2 Grid Transformers (GT1 and GT2) 30/60 MVA 132/33 kV, associated assets and civil works • Associated non-lead assets 	

- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Inverness 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Craigiebuckler to Woodhill CW1/CW3 Cable (SHNLT2055)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, CW1 and CW3 have an EOL score of 4.91 and 5.42 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>CW1/CW3 is a fluid filled cable that connects Craigiebuckler and Woodhill substations. These cables were manufactured in 1972 and will be 59 years old by the end of T3. They are operating well in excess of their design life and are expected to be the only fluid filled circuit cables left on the SHE Transmission network by RIIO T3.</p> <p>CW1 and CW3 cables feed Woodhill substation from Craigiebuckler substation, and form part of the Aberdeen ring between Craigiebuckler and Willowdale substations. There are no circuit breakers at Woodhill 132kV substation on CW1/WJ1 or CW3/WJ3 circuits and so any fault on CW1 or CW3 would remove supply to one of the GTs at Woodhill 132kV and break the Aberdeen ring.</p> <p>Both cables have a history of oil leaks that have required frequent intervention in the last twenty years.</p> <p>The route is entirely urban which make planning and replacement of this cable complex due to the level of disruption incurred to the city.</p> <p>Woodhill, Willowdale and Craigiebuckler are also considered very high criticality sites under NARMs. Therefore CW1 and CW3 are also considered to be very high criticality assets under NOMs.</p> <p>There is also a requirement for intervention at Woodhill substation. This is unlikely to be an in situ like for like replacement. Retention of these oil filled cables would therefore require re-jointing and use of a transition joint which is considered impractical and undesirable. A joined up approach is therefore required in delivery.</p> <p>Due to the nature of the Aberdeen city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Aberdeen’s security of supply is required.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, CW1/ CW3 was subject to a Pre-Construction Funding Request of £1.625m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p>	

Scope

The Transmission works required are as follows:

- Replace 2 fluid filled 132kV cables
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated for CW1/CW3 cables, these works include:

- Review governance documentation to confirm scope; update governance documentation at the end of this phase in preparation for the next phase, this will include programme, risk and finance project information for the project.
- Confirm the technologies for the cable and confirm cable corridor
- Environmental surveys that include noise and habitat along the cable route and substation tie-ins
- Write and tender the contractor design scope; award scope of work to undertake ground investigation of the cable route and cable design during this phase
- Engage with landowners and interested 3rd parties along the cable route
- Undertake stakeholder engagement throughout this phase with landowners, statutory stakeholders, local government, community and other interested stakeholders

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q1 2023
Engineering and environmental studies complete	Q1 2024
Public Engagement	Q2 2024
Appoint contractor(s)	Q4 2024
Complete Initial contractor design	Q4 2025
Construction Start	Q1 2026
Energisation	Q2 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Dudhope Substation
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Dudhope GT1 and GT3 have an EOL score of 8.3 and 8.64 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Dudhope GT1 and GT3 were manufactured in 1965 and by the end of T3 will be 66 years old. The site is in a medium-risk location under ESQCR. The substation is indoor at the centre of Dundee and enclosed on all sides by neighbouring properties including those owned by Police Scotland. The existing layout does not meet current design standards for segregation and access. Due to the indoor urban location, there is no available land to expand into at the existing location.</p> <p>GT1 and GT3 are located indoors in individual rooms adjacent to each other. In the event of a failure, it would not be possible to replace either GT in situ as they are built into the building. Further, there is no space provision on or adjacent to the existing site to allow for asset replacement. Proactive, carefully planned intervention is therefore the responsible approach, including the identification and procurement of a suitable alternative location within a city centre location.</p> <p>The latest oil samples show a reduction in breakdown strength (GT1 main and selector tanks), increase in dielectric dissipation factor (GT1 main and selector tanks, and GT3 selector tank) and visually dark/clear oil with a colour number suggesting incipient contamination signature. This may indicate some form of contamination, oxidation or degradation. Both GT2 and GT3 have Operational Restrictions on their tap changers, requiring an exclusion zone. There is evidence of oil leaks on pipework, gaskets and seals of GT1 and GT3.</p> <p>Since 2016, the loads on Dudhope GT1 and GT3 have been increased with the addition of load transferred from Glenagnes GSP. In normal operation, with both GTs in service, the maximum recorded load is within 5MVA of ONAN rating.</p> <p>Due to the current network configuration, and lack of any 132kV circuit breakers at Dudhope, a fault on GT1 will also trip transformers at Milton of Craigie, Glenagnes and Lyndhurst, effectively placing the entire city on single circuit risk.</p> <p>The consequence of a failure for GT1 or GT3 makes these assets very high risk for the security of supply for Dundee. It is considered very high criticality under NARMS. While it is theoretically possible to support all customer by way of backfeeds under contingency plans, this relies on legacy assets at Glenagnes substation.</p> <p>Due to the nature of the Dundee city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Dundee’s security of supply is required.</p>	

This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.

Funding Request

Based on the latest asset data available, we have replaced Beaully Shin, Strichen/Fraserburgh/ St Fergus, and Nairn/ Keith, which were included within the December business plan with alternative schemes: Persley substation, Dudhope substation, Dundee OHL circuits, and Charleston – Errochty OHL circuits. We are requesting £1.300m of Pre-Construction Funding for Dudhope. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.

Scope

The Transmission works required are as follows:

- Replace 2 Grid Transformers (GT1 and GT3) 30/60 MVA 132/33 kV and associated assets and civil works
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Dudhope 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2023 Completion
Project start	Q3 2023
Public Engagement	Q1 2024
Engineering and environmental studies complete	Q2 2024
Appoint contractor(s)	Q4 2024
Complete Initial contractor design	Q3 2025
Construction Start	Q1 2026

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Topic/Activity:	Milton of Craigie Substation (SHNLT2052)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Milton of Craigie GT2 and GT3 have an EOL score of 8.92 and 8.76 respectively by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Milton of Craigie GT2 and GT3 were manufactured in 1965 and 1972 and by the end of T3 will be 66 and 59 years old respectively. The site is in a high-risk location under ESQCR as it sits in between housing estates and a supermarket within the city of Dundee. Due to its urban location, there is no available land to expand into and this limits the options available for replacement within the existing perimeter.</p> <p>The oil sampling of GT2 shows an increasing trend of acidity. Both GT2 and GT3 have Operational Restrictions on their tap changers, requiring an exclusion zone. There is also evidence of multiple oil leaks from the main tank lid and bushings of GT2 and GT3. Both assets are also displaying signs of rust.</p> <p>GT2 and GT3 are located adjacent to each other without adequate fire separation under current design standards. In the event of a catastrophic failure, it is likely both GTs would be taken out of service as they are within the fire damage zones of each other. There is an oil filled cable running from GT3 to its busbar connection within the substation.</p> <p>Due to the current network configuration, and lack of a transformer circuit breaker, a fault on GT2 will also trip transformers at Dudhope, Glenagnes and Lyndhurst, effectively placing the entire city on single circuit risk.</p> <p>The consequence of a failure for GT2 or GT3 makes these assets very high risk for the security of supply for Dundee. It is considered very high criticality under NARMS. It is not possible to backfeed in excess of 20,000 customers at Milton of Craigie under contingency plans.</p> <p>Due to the nature of the Dundee city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Dundee’s security of supply is required.</p>	

This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.

Funding Request

Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Milton of Craigie was subject to a Pre-Construction Funding Request of £0.975m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.

Scope

The Transmission works required are as follows:

- Replace 2 Grid Transformers (GT2 and GT3) 30/60 MVA 132/33 kV and associated assets and civil works
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Milton of Craigie 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	<p>Charleston – Errochty OHL circuits</p> <p>EG1/EG2/GA2/GP1/CAS/ PCN</p> <p>(no reference available as not included in BPDT, but will be included in planned resubmission of BPDT in due course)</p>
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology the towers on these lines have an EOL score ranging between 8.00 to 8.95 by the end of T3. In addition, the conductor on these lines have an EOL score of between 7.49 to 8.47, and the fittings are forecast to range between 8.09 and 10.19.</p> <p>Requirement and Driver(s)</p> <p>The circuits on the Charleston to Errochty route contain 346 towers and spans 131km – comprising of 6 circuits between 5 substations. Most of the Charleston to Errochty line was constructed between 1931 and 1940. By the end of T3, 114 of these towers will be 99 years old, making the line among the oldest on the SHE Transmission network.</p> <p>This project will require extensive route planning and stakeholder engagement to deliver the required interventions. The towers vary in risk as they pass through both urban and rural settings, as well as crossing the river Tay.</p> <p>Drone inspection photography shows that these towers are displaying extensive rusting, covering much of the tower surface areas.</p> <p>From the most recent visual inspections, scores of 3 and 4 (1-4 scale of deteriorating condition) have been recorded for stubs and muffs, tower steel work and conductor span across all the lines.</p> <p>The line is the only connection for Abernethy, Griffin Windfarm and the City of Perth (Burghmuir), which is also home to SHETL and SHEPD control rooms. Due to the age, condition and criticality of the line, in addition to the number of towers and length of the route, this large-scale project is suitable for PCF to ensure an efficient and coordinated approach can be taken.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p>	

Based on the latest asset data available, we have replaced Beaully Shin, Strichen/Fraserburgh/ St Fergus, and Nairn/ Keith, which were included within the December business plan with alternative schemes: Persley substation, Dudhope substation, Dundee OHL circuits, and Charleston – Errochty OHL circuits. We are requesting £1.703m of Pre-Construction Funding for the Charleston to Errochty circuits. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.

Scope

The Transmission works required are as follows:

- Replace/refurbish the circuits on the OHL route between Charleston and Errochty
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated for OHL circuits between Charleston and Errochty, these works include:

- Review governance documentation to confirm scope; update governance documentation at the end of this phase in preparation for the next phase, this will include programme, risk and finance project information for the project.
- Confirm the technologies for the Overhead line, routing corridor and alignment
- Environmental surveys that include visual and landscape, noise and habitat along the OHL route and substation tie-ins
- Write and tender the contractor design scope; award scope of work to undertake ground investigation of the OHL route and initial OHL alignment and cable design during this phase
- Engage with landowners along the OHL route
- Undertake stakeholder engagement throughout this phase with landowners, statutory stakeholders, local government, community and other interested stakeholders

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q1 2023
Engineering and environmental studies complete	Q1 2024
Public Engagement	Q2 2024
Appoint contractor(s)	Q4 2024
Complete Initial contractor design	Q4 2025
Construction Start	Q1 2026
Energisation	Q2 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Lyndhurst Substation (SHNLT2051)
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology, Lyndhurst GT1 and GT2 each have an EOL score of 8.92 by the end of RIIO-T3.</p> <p>Requirement and Driver(s)</p> <p>Lyndhurst GT1 and GT2 were manufactured in 1966 and by the end of T3 will be 65 years old and well in excess of their design life. The site is in a medium risk location under ESQCR as it sits in a business park, adjacent to the main dual carriageway through the city of Dundee. There is space within the existing site which may be possible to utilise, but this will require a network reconfiguration to do so. Due to its urban location, there is no spare land to expand the site into. The substation is located adjacent to the Kingsway dual carriageway.</p> <p>The oil sampling has previously highlighted an increasing moisture trend which is now being actively managed. Both GT1 and GT2 have Operational Restrictions on their tap changers, requiring an exclusion zone.</p> <p>GT1 and GT2 are located adjacent to each other separated by a fire wall. GT2 has evidence of leaking oil via the main tank lid.</p> <p>Due to the current network configuration, and lack of a transformer circuit breaker, a fault on GT1 will also trip transformers at Dudhope, Glenagnes and Milton of Craigie, effectively placing the entire city on single circuit risk.</p> <p>The consequence of a failure for GT1 or GT2 makes these assets very high risk for the security of supply for Dundee. Lyndhurst is considered high criticality under NARMS.</p> <p>Due to the nature of the Dundee city network arrangement, and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Dundee’s security of supply is required</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p>	

Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Lyndhurst was subject to a Pre-Construction Funding Request of £0.943m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.

Scope

The Transmission works required are as follows:

- Replace 2 Grid Transformers (GT1 and GT2) 30/60 MVA 132/33 kV, associated assets and civil works
- Associated non-lead assets
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key **PCF** works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Lyndhurst 132/33 kV Substation, these works include:

- Substation Site Optioneering and Selection
- Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types)
- Engineering Studies to establish the type of grid transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2029 Completion
Project start	Q3 2025
Public Engagement	Q1 2026
Engineering and environmental studies complete	Q2 2026
Appoint contractor(s)	Q4 2026
Complete Initial contractor design	Q3 2027
Construction Start	Q1 2028
Energisation	Q1 2029

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Dundee 132kV OHL circuits CM1/CM2, TCE/TCW, TM1/TM2
<p>Introduction</p> <p>The SHE Transmission paper, “A Risk-based Approach to Asset Management”, published as part of our RIIO-T2 Business Plan submission, outlines the methodology we have used to develop our programme of non-load interventions that we believe are essential and deliverable within the RIIO-T2 period.</p> <p>This methodology also allows SHE Transmission to forecast beyond the constraints of the RIIO-T2 period, identifying assets that we believe will require intervention within the RIIO-T3 period.</p> <p>This paper seeks funding during RIIO-T2 period to allow SHE Transmission to develop asset intervention schemes for delivery in the first years of the RIIO-T3 period.</p> <p>Under the NARM methodology the towers on these lines have an EOL score ranging between 8.28 to 10.00 by the end of T3. In addition, the conductor on these lines have an EOL score of between 7.71 to 14.10, and the fittings are forecast to range between 9.64 and 10.19.</p> <p>Requirement and Driver(s)</p> <p>Lyndhurst to Charleston (CM1/CM2) is a short section of 9 towers which span 1.9km and were constructed in 1940. By the end of T3, these 9 towers will be 89 years old. This tower line is located within a housing estates and 8 of the 9 towers are considered high risk under ESQCR.</p> <p>Charleston to Tealing (TCE/TCW) has 38 towers which spans 9.4km and were constructed in 1959. By the end of T3 these 38 towers will be 72 years old. This tower line is located within both residential areas in Dundee and farmland around Tealing.</p> <p>Milton of Craigie to Tealing (TM1/TM2) has 25 towers which spans 7km and were constructed in 1959. By the end of T3 these 25 towers will be 72 years old. This tower line is located within housing estates in Dundee and farmland on its route to Tealing.</p> <p>From the most recent visual inspections, scores of 3 and 4 (1-4 scale of deteriorating condition) have been recorded for stubs and muffs, tower steel work and conductor span across all the lines.</p> <p>Both Charleston and Milton of Craigie substations are located in residential areas and are next to the main ring road of Dundee. Intervention on overhead lines in an urban location requires detailed planning and stakeholder engagement.</p> <p>Due to the nature of the Dundee city network arrangement and given that work is going to be required across the ring, PCF to ensure an efficient, coordinated and whole system approach to improving Dundee’s security of supply is required.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Based on the latest asset data available, we have replaced Beaully Shin, Strichen/Fraserburgh/ St Fergus, and Nairn/ Keith, which were included within the December business plan with alternative schemes: Persley substation, Dudhope substation, Dundee OHL circuits, and Charleston – Errochty OHL circuits. We are requesting £0.247m of Pre-Construction Funding for the Dundee 132kV OHL circuits. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p>	

Scope

The Transmission works required are as follows:

- Replace/refurbish the circuits on the OHL routes between Charleston and Lyndhurst, Tealing and Charleston, and Tealing and Milton of Craigie
- Further scope subject to variation through optioneering

Programme

In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated for CW1/CW3 cables, these works include:

- Review governance documentation to confirm scope; update governance documentation at the end of this phase in preparation for the next phase, this will include programme, risk and finance project information for the project.
- Confirm the technologies for the Overhead line, routing corridor and alignment
- Environmental surveys that include visual and landscape, noise and habitat along the OHL route and substation tie-ins
- Write and tender the contractor design scope; award scope of work to undertake ground investigation of the OHL route and initial OHL alignment and cable design during this phase
- Engage with landowners along the OHL routes
- Undertake stakeholder engagement throughout this phase with landowners, statutory stakeholders, local government, community and other interested stakeholders

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2029 Completion
Project start	Q4 2025
Public Engagement	Q3 2026
Engineering and environmental studies complete	Q3 2026
Appoint contractor(s)	Q1 2027
Complete Initial contractor design	Q4 2027
Construction Start	Q2 2028
Energisation	Q3 2029

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.

Scheme:	Orrin Substation (SHNLT2053)
<p>Requirement and Driver(s)</p> <p>Orrin GT1 was manufactured in 1958 and by the end of T2 will be 68 years old. Being a hydro site, the load profiles show frequent changes in load from minimum loading to peak loading on GT1. The GT is subject to these load swings which, although within the continuous maximum rating of the transformer, will exert a thermal impact upon the windings. Any sudden thermal impacts can exacerbate the degrading insulation structure and further weaken the mechanical strength of the insulation.</p> <p>The oil sampling from GT1 indicate consistently high acidity and has experienced wet oil.</p> <p>The location of the transformer is sheltered in all directions by a combination of the landscape, hydro station building and substation walls and this has likely contributed to its longevity. However, it is now displaying signs of rust and leakage.</p> <p>There is a voltage concern that has been raised by the customer and as a result they have requested the tap to be adjusted to mitigate the issue. The existing GT is not fitted with a tap changer and therefore does not allow us to change the tap without intrusive manual intervention.</p> <p>Furthermore, the protection and ancillary equipment are located within a third party building. In order to replace GT1 we will need to add a 1T0 breaker which cannot be carried out in situ. Due to the topography of the site, expansion will be very difficult. The substation is already stepped across two levels and very close to the Loch within a picturesque rural location which will have an impact on planning.</p> <p>This paper sets out our plans to undertake pre-construction activities during the RIIO-T2 period.</p> <p>Funding Request</p> <p>Within the Pre-Construction Funding Request of the RIIO-T2 Business Plan, Orrin Substation was subject to a Pre-Construction Funding Request of £0.975m. The funding provided will be utilised to undertake the Pre-Construction Activities set out in the Programme Section of this response during the RIIO-T2 Period.</p> <p>Scope</p> <p>The Transmission works required are as follows:</p> <p>Orrin Substation GT1 replacement</p> <ul style="list-style-type: none"> • Install 1 new Grid Transformer (GT1) 20 MVA 132/11 kV • Install a new Earthing transformer and associated civil works • Install a circuit breaker and include a SHE Transmission owned VT <p>Programme</p> <p>In order to deliver this project either within the RIIO-T3 period, it will be necessary for the project to be progressed through the Pre-Construction Phases within RIIO-T2. Key PCF works which will have to be completed during RIIO-T2 to ensure the delivery of the works associated at Orrin 132/33/11 kV Substation, these works include:</p> <ul style="list-style-type: none"> • Substation Site Optioneering and Selection and Overhead Line Route Optioneering and Selection • Environmental Surveys at and surrounding the Substation site (including assessments on protected species, noise, landscape and visual, impact on watercourses and ground types) 	

- Engineering Studies to establish the type of grid and earthing transformer, layout and design of equipment, installation design, impact of construction traffic, flood risk assessments, positioning of Overhead Line Towers, write works information for contractor engagement
- Consultation with stakeholders and the wider public at various points through the Pre-Construction Phases to gain their feedback on the proposals
- Detailed Design and Surveys to inform the commencement of the construction phase

Key dates for meeting both the contracted and proposed completion dates are shown below:

Stage	Timeline for 2028 Completion
Project start	Q3 2024
Public Engagement	Q1 2025
Engineering and environmental studies complete	Q2 2025
Appoint contractor(s)	Q4 2025
Complete Initial contractor design	Q3 2026
Construction Start	Q1 2027
Energisation	Q1 2028

It is requested Pre-Construction Funding is made available within the RIIO-T2 Baseline Funding to allow the timely progression of these significant Asset Management projects within the Price Control Period.