January 2026

Powerlink 2027-32 Revenue Proposal

Project Pack

CP.02631 Ross to Dan Gleeson 132kV Transmission Line Refit

Project Status: Unapproved

Network Requirement

The Ross to Dan Gleeson 132kV transmission line was first established in 1979 as part of a 132kV transmission line from Collinsville Power Station to Garbutt Substation. It is a double circuit 132kV steel tower transmission line operating in a tropical environment. The line is approaching 50 years old and is nearing the end of its technical service life with the majority of structures exhibiting signs of degradation [1].

Powerlink's 2025 Central scenario forecast confirms there is an enduring need to maintain electricity supply in the Townsville area. The removal of the Ross to Dan Gleeson 132kV line at the end of its technical life would violate Powerlink's N-1-50MW/600MWh Transmission Authority reliability standard and significant impact electricity supply within the Townsville area. [2].

Consistent with the findings and recommendations of Powerlink's Asset Reinvestment Review Working Group Powerlink targets reinvestment in transmission line structures that will reach a health index (HI) of 8 or greater within the next five years. Powerlink must therefore take action to maintain existing electricity services, ensuring an ongoing reliable, safe and cost-effective supply to customers in the Townsville area.

Recommended Option

As this project is currently 'Unapproved', project need and options will be subjected to the public RIT-T consultation process to identify the preferred option closer to the time of investment.

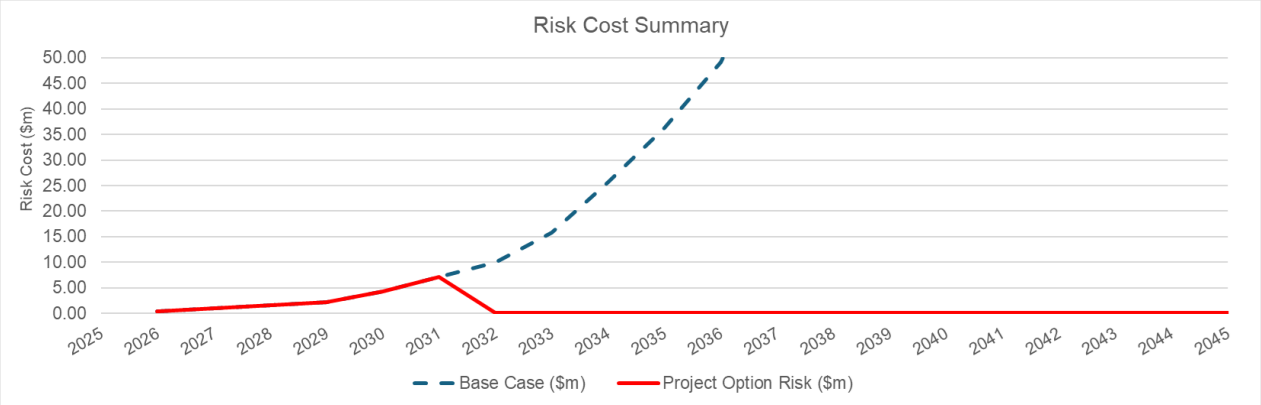
The current recommended option is to undertake a single stage of targeted refit works to extend the service life of the Ross to Dan Gleeson 132kV transmission line for a further 15 years [3].

Options considered but not proposed include:

- Staged refit of selected structures on the Ross to Dan Gleeson line with the first stage to be completed by 2031 and the second stage by 2036 – expected to be higher net present cost.

Figure 1 shows the current recommended option reduces the forecast risk monetisation profile of the Ross to Dan Gleeson transmission line from around $7.1 million per annum in 2031 to less than $0.2 million from 2032 [4].

Figure 1 Annual Risk Monetisation Profile ($ Real, 2025/26)



Cost and Timing

The estimated cost of the refit works on the Ross to Dan Gleeson 132kV transmission line is $5.5 million ($2025/26) [5].

Target Commissioning Date: September 2030.

Documents in CP.02631 Project Pack

Public Documents

1. BS1257 Ross to Dan Gleeson Condition Assessment Report
2. CP.02631 Ross to Dan Gleeson 132kV Transmission Line Refit – Planning Statement
3. CP.02631 Ross to Dan Gleeson 132kV Transmission Line Refit – Project Scope Report
4. CP.02631 Ross to Dan Gleeson 132kV Transmission Line Refit – Concept Estimate
5. CP.02631 Ross to Dan Gleeson 132kV Transmission Line Refit – Risk Cost Summary Report

BS1257: ROSS – STR-1043 (DAN GLEESON) 132KV

Condition Assessment Report

ROSS – STR-1043 (DAN GLEESON) 132KV

BS 1257

Document Details	
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Document Version History				
Date	**Version**	**Nature of Change**	**Author**	**Authorisatio**
30/12/15	1.0	Original	[redacted]	[redacted]

Note: *Where indicator symbol ☼# is used (# referring to version number) it indicates a change/addition was introduced to that specific point in the document. If the indicator symbol ☼# is used in a section heading, it means the whole section was added/changed.*

IMPORTANT: - This Condition Assessment Report provides an overview of the SAP built section meters outlined in the Report's Scope. As it is snapshot in time based upon available data and the accuracy of the prediction methodology, any estimates of remaining life are valid for 3 years only from the date of the report's approval.

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1.0 Executive Summary

1.1 General Comments

The 23 structures on BS 1257 formed a portion of a 132kV transmission line between Collinsville and Garbutt substations, originally commissioned in 1978.

The section from Ross substation to structure 1480 was commissioned in 1978 as part of a new feeder from Collinsville Power station to Garbutt. Tension structure 1043 was constructed in 1963 as part of the original feeders from Clare substation to Garbutt substation. This structure now marks the northern extent of BS1257.

All warning and asset identification signs on BS1257 have also been progressively replaced.

The original earth-wires and associated hardware were replaced in 2004.

Foundations are generally bored under-cut concrete type and mass concrete, however the top cap on many of the bored foundations has extensive radial cracks which will allow the ingress of moisture over time. This will result is corrosion of steel reinforcing and eventual action level defects on the tower leg stubs. A further six structures require corrective action in the short term.

Cross arm, superstructure and body tower members are exhibiting some early evidence of Grade 2 corrosion, although none have yet suffered a total loss of their galvanised coatings.

Approximately 10% of the superstructure and cross arm tip nuts and bolts are displaying early Grade 3, based for the most part on their sheltered location on the structure.

The line sits in a medium rainfall area with average 58% humidity. Exposed carbon steel in this environment (C3: including tropical with low pollution) will corrode at between 25-50 micrometres per annum, which is 35-70 times faster than galvanised coatings. This could potentially result in the loss of 0.5mm of steel within 10-20 years.

The conductors are in sound condition and are considered to have at least another 25 years remaining life.

Based upon the 2008-2015 photographic evidence, SAP Notifications and SAP Measuring Documents used in this report, the estimated remaining service life for BS 1257, WITHOUT any refurbishment, life extension or increased maintenance is 15 years. It is noted that to achieve this life, foundation repairs are required within the next 12 – 18 months.

NOTE: This estimate is valid for a maximum of 3 years, after which new evidence will need to be collected and analysed.

1.2 Component Summary:

The table below summarises the average condition of each major component on Built Section 1257 between Ross and Dan Gleeson Substations.

Average Observed Corrosion Grades are based upon existing Powerlink Visual Inspection Guides, as applied to 2015 field data and maintenance records.

Built Section Meter	Year of Commissioning	Corrosion Grade/Comment
Foundations	1978	G3#
Structure		Overall 8% of bolts and 1% of members exhibit G2 corrosion. There are no significant occurrences of G3 corrosion,
• Climbing Aids	1978	G2^ 13%
• Anti-Climbing Barriers	1978	G1
• Tower Base	1978	G1
○ Steel members		G1
○ Nuts and Bolts		
• Tower Body	1978	G1
○ Steel Members		G2 5%
○ Nuts and Bolts		
• Superstructure	1978	G1
○ Steel Members		G2 8%
○ Nuts and Bolts		
• Conductor Attachment Plate	1978	G2 20%
○ Nuts and Bolts		
• Cross Arms	1978	G1
○ Steel members		G2 15%
○ Nuts and Bolts		
• Earthwire Peak	1978	G1
○ Steel members		G2 12%
○ Nuts and Bolts		

Built Section Meter	Year of Commissioning	Corrosion Grade/Comment
Earthing	1978	No visible deterioration
Conductor	1978	No visible deterioration
Conductor Hardware	1978	Does not meet operational performance requirements
Conductor Mid-Span Joints	1978	No visible deterioration
Earthwire & OPGW	2004	G1
Earthwire & OPGW Hardware	2004	G3*
Suspension Insulators	1998, 2001	G2 56%
Suspension Insulator Hardware • Forged and Pressed Parts	1978	G2 100%
Bridging Insulators and Hardware • Insulators • Forged and Pressed Parts	2001, 2014	G1 G2 100%
Tension Insulators	1993, 2004, 2015	G1
Tension Insulator Hardware • Forged and Pressed Parts	1978	G1
Signage	2013	G1

\# The majority of the line's standard reinforced concrete foundations show no signs of deterioration above ground but cracks in the foundation footing indicate water ingress and Grade 3 & 4 corrosion have been observed.

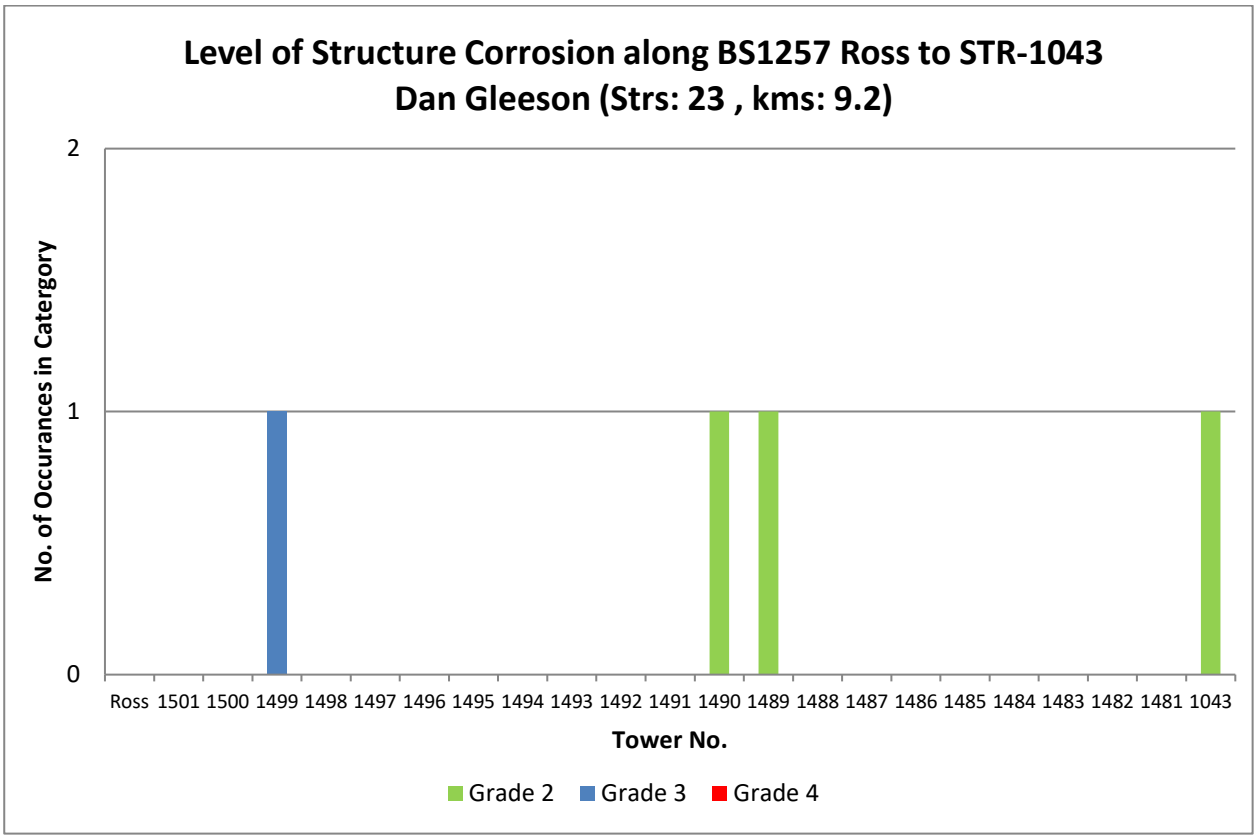
^ Step bolts no longer meet current Powerlink standards that require them to be used as an attachment point.

** Grade 2 Corrosion Observed. ***Monitor and Review***

× Grade 3 Corrosion representing a total loss of galvanising and the onset of unprotected carbon steel corrosion has been observed on at least 5% of the component group. ***Estimated time until loss of 0.5mm of carbon steel in this environment is 10-20 years***

* Grade 3 Corrosion Observed on OPGW downlead clamp bolts

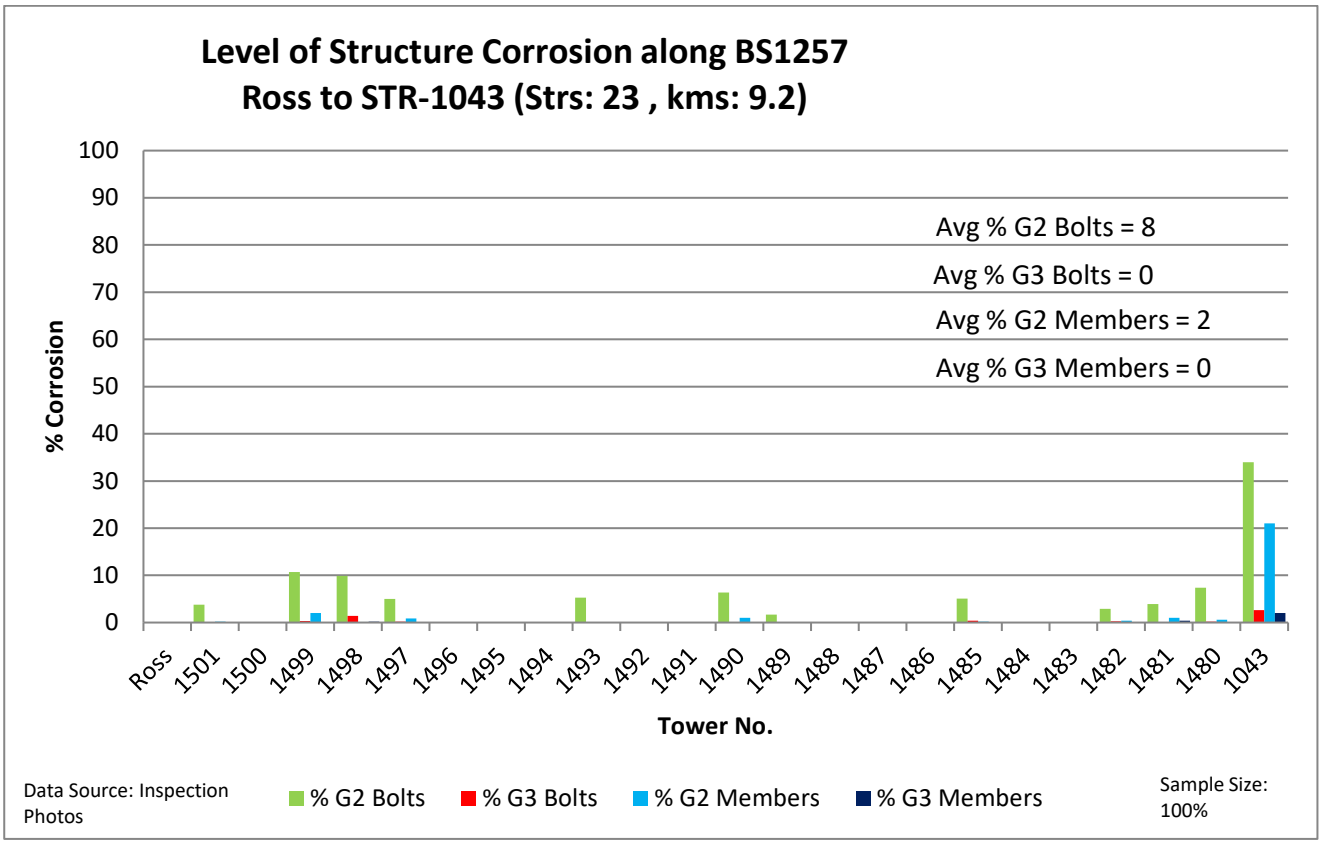
1.3 Notification Overview for Structures



The above graph shows the number of notifications relating to corrosion on each structure. It can be seen that have only been a small number of notifications raised throughout this built section and these will be addressed through maintenance procedures.

1.4 Structure Corrosion along Built Section

The graph below shows the percentage of corrosion on structures throughout the built section based on ground patrol photos taken between 2013 and 2015. Note that Grade 4 corrosion is not captured as part of this condition data as it is classed as a defect and recorded as a Notification.



2.0 Purpose

This report outlines the assessed condition of the Ross – Dan Gleeson 132kV transmission line and has been produced to assist in developing a future asset management strategy for the line.

The report examines the condition of the line's major component groups, using field data and maintenance records from 2012 - 2015, and assigns them a corrosion grade based upon existing Asset Management classifications.

3.0 Scope

SAP "Built Section Meters" have been used as the basis of categorising the transmission line components in this Condition Assessment Report.

Built Section Meters			
1	Foundations	**8**	Earthwire Hardware
2	Structure	**9**	Earthwire Mid-span Joints
3	Earthing	**10**	Suspension Insulators
4	Conductor	**11**	Suspension Insulator Hardware
5	Conductor Hardware	**12**	Tension Insulators
6	Conductor Mid-span Joints	**13**	Tension Insulator hardware
7	Earthwire	**14**	Signage

In addition to the built section meters the easement condition has also been assessed.

The Corrosion Grade assigned to each Built Section component is based on the corrosion/deterioration classifications used in Powerlink's existing Visual Guides, and has been assessed as :-

- A single value indicates **at least 5%** of the components exhibit the condition.
- A range of values indicates at **least 5% of the components exhibit the lower value and at least 5% exhibit the higher value.**
- A value of "no deterioration" indicates no deterioration, or minor deterioration impacting **less than 5% of components.**

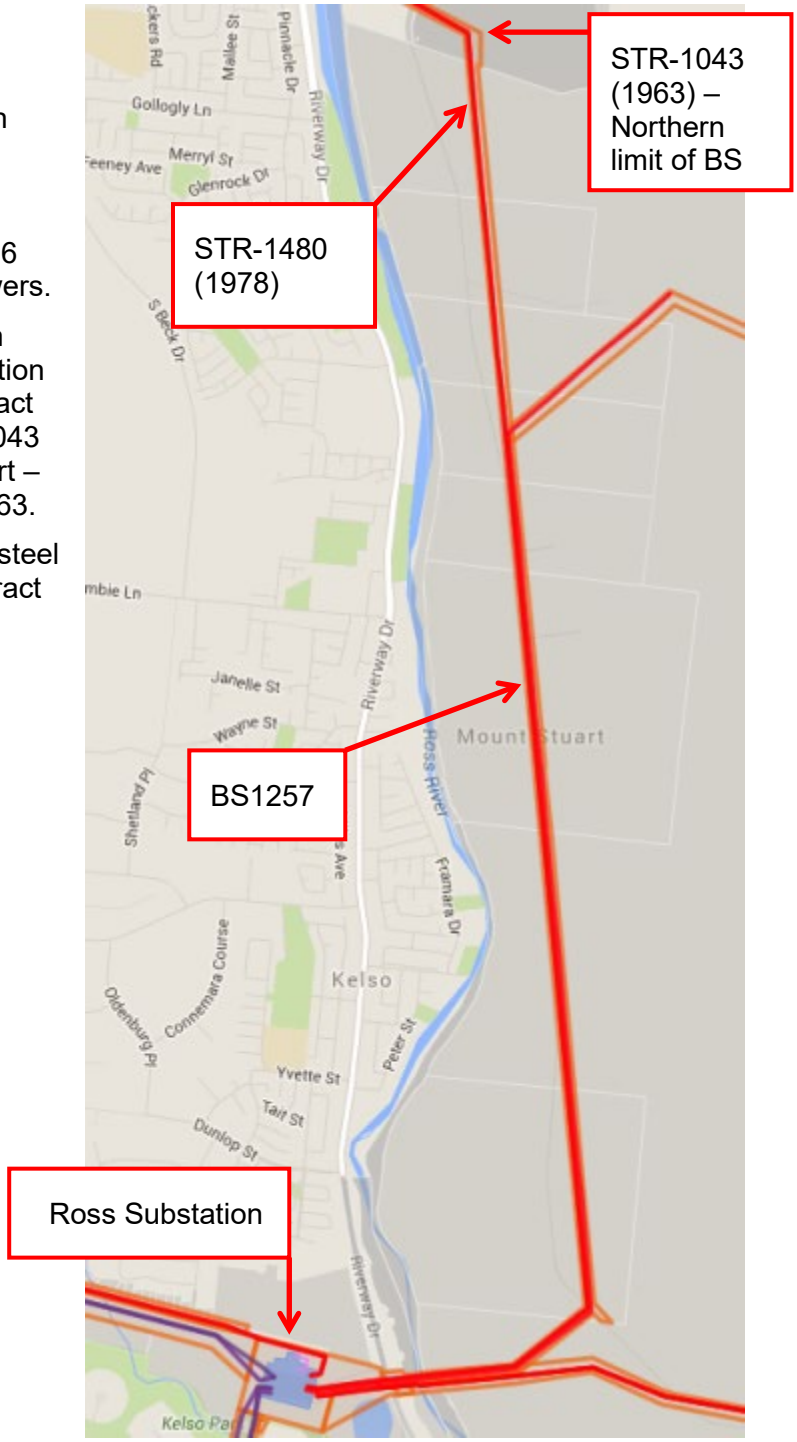
4.0 Transmission Line Parameters

4.1 Overview

The Ross – Structure 1043 on Built Section 1257 132 kV transmission line is 9.2km in length and consists of 7 Steel Lattice Tension Towers and 16 Steel Lattice Suspension Towers.

The line was commissioned in 1978 and consists of built section 1257 constructed under contract number N329/76. Structure 1043 was originally part of the Stuart – Garbutt line constructed in 1963.

This report only covers those steel lattice towers built under contract N329/76 and structure 1043.



4.2 Summary Table

Item	Specification
The Line	The line was constructed under contract number N329/76 and consists of Built Section 1257
Commissioning Date	16.11.1978
Voltage	132KV
No. of Circuits	2
Circuits	Feeder 7144/1 Feeder 7151/1
Length of Line	9.20km
No. of Towers	16 x Steel Lattice Suspension Towers 7 x Steel Lattice Tension Towers
Foundations	Standard Reinforced Concrete
Conductor	Lime ACSRI NORMAL 30/7/3.50 – Single Bundle
Earthwire	**A side:** 14.0mm Alcoa OPGW installed 2004 **B side:** 13.2mm AACSR/AC Volleyball installed 2004
Line Clamps	Suspension - AGSU Tension – Galvanised steel compression fittings
Dampers: Conductor	ES-1 Type Dampers
Dampers: OHEW	VDS-4D-20/20.3
Dampers: OPGW	VDS-4D-20/20.3
Avg Easement Width	40 metres
Insulators	
Suspension Insulators	SEDIVER Normal Disc 70kN Suspension Glass 9 Discs (1998) NGK Normal Disc 70kN Suspension Porcelain 9 Discs (1998)
Bridging Insulators	NGK Fog Disc 70kN Bridging – Porcelain 9 Disc (2001 & 2014)
Tension insulators	NGK Fog Disc 125kN_Tension Porcelain 9 Disc (1993)

5.0 Location and Environment

5.1 General Location

The transmission line is located in the greater Townsville urban area between Powerlink's H013 Ross and T092 Dan Gleeson Substations.

The route is on the east side of Ross River and on the western slope of Mt Stuart and is 15 – 20km from the coastline.

5.2 Land Use

The route's land use is dominated by the operations of the Commonwealth Military defence base in Townsville.

5.3 Atmospheric Corrosion

The Ross – Dan Gleeson 132kV transmission line is located approximately 15 kilometres from the coast and experiences an average rainfall of 1100mm. Mean annual humidity is 58%.

The highest rates of galvanised steel corrosion normally occur on sheltered or partially sheltered steel members, nuts, bolts and joint interfaces. Reduced exposure to cleansing rains and drying winds creates a microenvironment where the accumulation of air-borne pollutants and trapped moisture accelerates the corrosion process.

The thickness of the original coating also determines the subsequent service life of the coating as the rate of zinc loss is constant for a given geographical area.

This increased potential for corrosion based upon microclimatic conditions and coating thickness is consistent with the observed condition of Powerlink's galvanised steel lattice towers, with spot rusting of major members accompanied by more advanced rusting of nuts, bolts and joint nodes.

Once the galvanised coating has been damaged or deteriorated to the point where visible corrosion is evident, the steel has effectively begun to break down (***AS/NZS 2312-2002 – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings***) This point has been adopted as Level 2 corrosion in Powerlink's Visual Grading Guides and triggers corrective action to prevent deterioration of the underlying steel component

The Galvanizers' Association of Australia (refer Section 7) estimates the service life of nuts, bolts and members in this location as follows.

Component	Minimum thickness µm	Estimated life to First Service in Years *(First Appearance of Grade 2)*
Bolts & nuts (Centrifuged)	42	22+
Members ≤ 6mm	70	33+
Members > 6mm	85	40+

Grade 3 Corrosion represents a total loss of galvanising and the onset of unprotected carbon steel corrosion. Rates of carbon steel corrosion can be between 10-300 times the rates of galvanised corrosion, depending upon the atmospheric conditions.

6.0 Condition Assessment

NOTE: Unless otherwise stated any Expected Remaining Life estimates are based upon the condition of the asset at the time the photographic evidence was collected in 2013 – 2015.

6.1 Tower Structure – Overview

The following table outlines the type and numbers of towers that make up Built Section1257. Body extensions vary between -6m and +6m.

Tower Types	Number	Body Extensions
LDSH	5	-3 to +6
LDSL	11	-6 to +3
LDAM	5	-3 to +6
A60R	1	-3
LDAM/T	1	0

6.2 Foundations

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	Estimated Life
1978	AM-PR-0835 Visual Grading of Galvanised Members	G3	10 years

All steel lattice tower foundations in BS 1257 are of the reinforced concrete type and no visible corrosion is apparent, however the foundation caps have radial cracking which will allow moisture ingress and corrosion to develop.

In November 2015, the concrete cap of structures STR-1486 and STR-1498 were removed to observe what corrosion has developed due to the cracking of the concrete. Both structures had Grade 3 or 4 corrosion and a further six structures have large cracks radiating from the interface between the tower leg and concrete cap.

The tower legs are painted and have tested positive to asbestos and will require treatment prior to repair work being carried out.

Tower leg of STR-1498 showing large cracks radiating from the tower leg and the corrosion visible once the concrete cap has been removed

6.3 Structure

6.3.1 Climbing Aids

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	Estimated Life
1978	AM-PR-0835 Visual Grading of Galvanised Members	G2 13%	M&R

Step bolts are the primary source of support for those linespersons and engineers required to ascend and descend the steel towers on this line. This arrangement is not compliant with current Powerlink fall arrest standards.

Step bolts are in a good condition with only minimal Grade 2 corrosion present on a small percentage of the bolts.

Typical condition of Step Bolts throughout BS1257

6.3.2 Anti-Climbing Barriers

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	Estimated Life
1978	AM-PR-0835 Visual Grading of Galvanised Members	G1	M&R

Towers have been fitted with a selection of barbed wire and crown-of-thorn type anti-climbing barriers depending upon their location. All anti-climb barriers remain in a serviceable condition.

Public access to the structures is limited as the majority of structures on BS1257 are located on Defence Force property.

Anti-Climb Barriers STR-1490

6.3.3 Tower Base

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0836 Visual Grading of Galvanised Members	G1	M&R
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G1	M&R

There is minimal corrosion observed on the bolts and members at the tower base with most sheltered light members and bolts at corrosion grade 1. Heavy members remain relatively unaffected, although cracking of the foundation concrete cap has caused corrosion below the ground level (see section 6.2 Foundations).

There are isolated instances (STR-0098) of Grade 3 corrosion caused by drainage and the build-up of soil.

Condition of Tower Legs STR-1490

6.3.4 Tower Body

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0836 Visual Grading of Galvanised Members	G1	M&R
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G2 5%	M&R

There is minimal corrosion evident on the bolts and members at the tower base with most sheltered light members and bolts at corrosion grade 1. Heavy members remain relatively unaffected.

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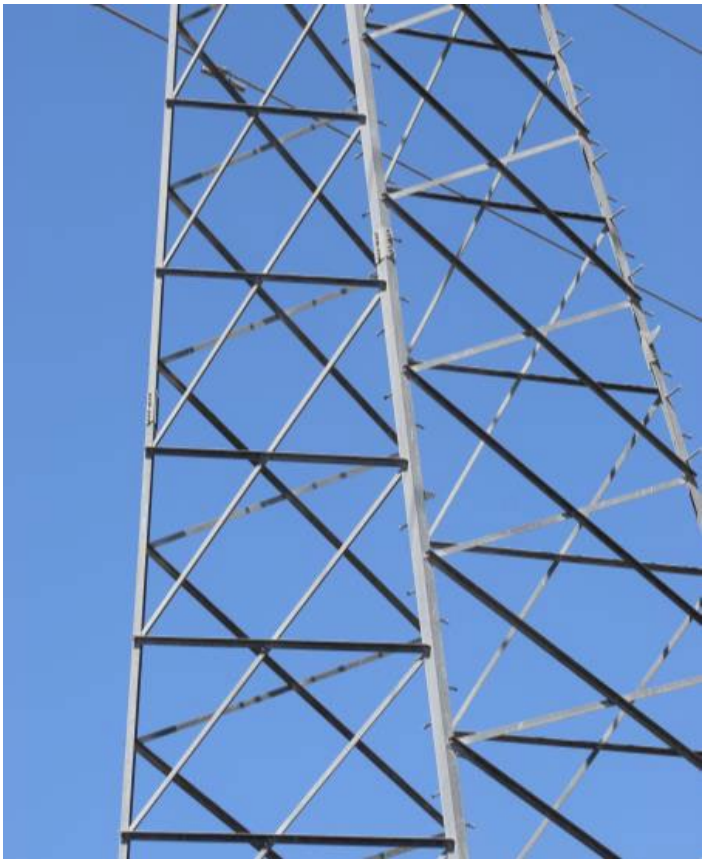


STR-1482 Condition of Tower Body

6.3.5 Superstructure

Year of Commissioning		Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0836 Visual Grading of Galvanised Members	G1	M&R
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G2 8%	M&R

There is minimal corrosion on superstructure members with less than 5% of structures inspected having Grade 2 corrosion. Grade 2 corrosion has been observed on 8% of connecting nuts and bolts.

Condition of Superstructure STR-1485

6.3.6 Conductor Attachment Plate

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G2 21%	M&R

The attachment plates are in a sound condition with Grade 2 corrosion evident. Corrosion at the interface between the conductor attachment and cross-arm members has been observed on several structures and will require periodic monitoring.

Conductor Attachment Bracket with Corrosion at Interface STR-1481

6.3.7 Cross-arms

Year of Commissioning		Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0836 Visual Grading of Galvanised Members	G2 7%	M&R
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G2 15%	M&R

The cross-arms are generally in a sound condition with Grade 2 beginning to emerge on the cross arm bolts and fasteners. Corrosion on cross-arm members is minimal with less than 5% Grade 2 observed, although structures that have elevated locations (STR-1043 and STR-1499) have a higher exposure to coastal winds and were observed to have a higher percentage of member corrosion.

Cross-Arm Condition STR-1043

6.3.8 Earthwire Peak

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0836 Visual Grading of Galvanised Members	G1	M&R
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	G2 12%	M&R

The earth peaks are generally sound with bolts and members in good condition and only low level corrosion evident on the majority of structures.

STR-1480 Earth Peak

6.4 Earthing

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade
1978	AM-POL-0174 Maintenance of Structure Earthing	No visible deterioration

Earthing of the steel lattice towers on the line was with hard drawn bare copper coated with an aluminium based paint earthing conductors and grading rings remain in sound condition. Footing measurements were recorded in 2010 and all structures (except STR-1496 which had a footing resistance of 19.6Ω) were within the design criteria.

Tower Earths STR-1487

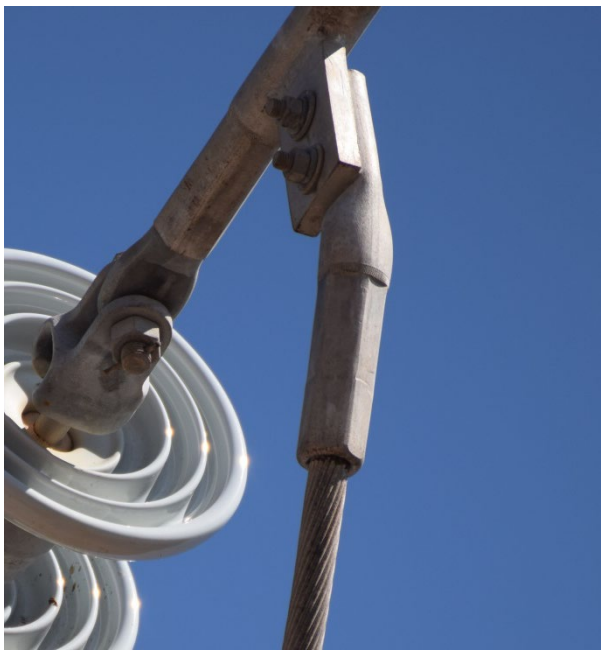
6.5 Conductor

Year of Commissioning	Condition Assessment Criteria	Condition
1978	AM-PR-0835 Visual Grading of Galvanised Bolts	No visible deterioration

The transmission line is strung with a single Lime ACSR/GZ conductor (30/7/3.50mm) on both sides with a maximum temperature of 95°C. The ACSR / GZ conductor contains a galvanised and greased central steel core and has an expected life of 80years.

Experience on conductors internationally has shown that after 35 to 45 years, moisture ingress and accelerated corrosion may occur. Visual examination of the conductor has not indicated any major defects which could be attributable to aluminium corrosion or overloading.

The Lime ACSR/GZ conductor is terminated with a two part compression dead-end and jumper bridge fitted by compression connectors. The galvanised bolts on the dead-ends are exhibiting Level 2 corrosion.



Dead-End Palm STR-1497

6.6 Conductor Hardware

Year of Commissioning	Condition Assessment Criteria	Condition
1978	AM-PR-1070 Vibration Dampers – In Service Inspection	Aged – no longer meets operational requirements

The transmission line has ES-1 type dampers that were installed during the commissioning of the line. These dampers are now aged and are now exhibiting signs of mechanical deterioration. The dampers no longer meet operational requirements and will require replacement.

ES-1 Dampers

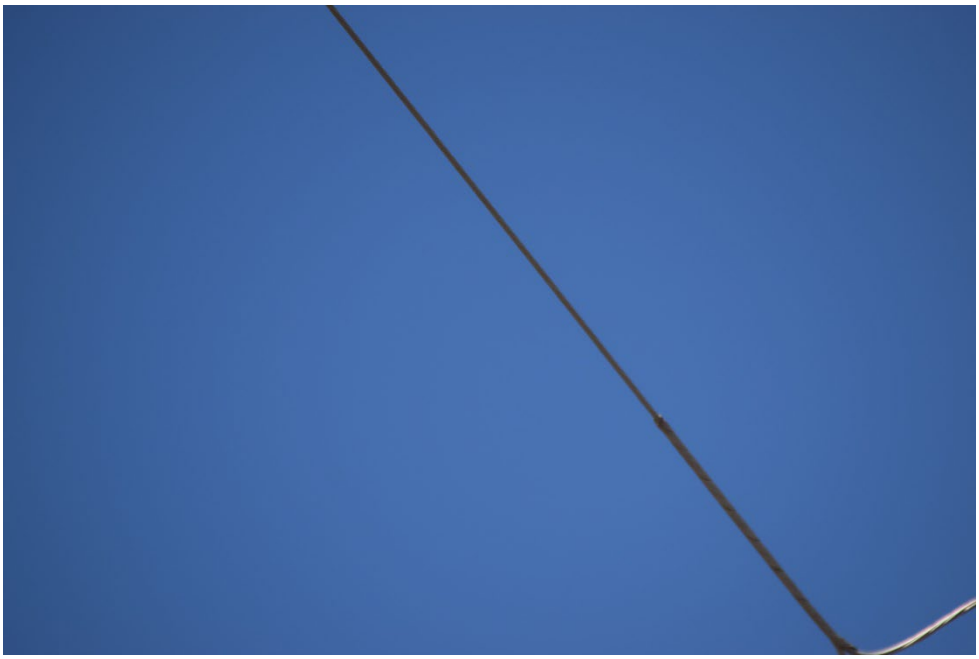
6.7 Conductor Mid-Span Joints

No issues have been observed with mid span joints.

6.8 Earthwire & OPGW

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to Loss of 0.5mm
2004	AM-PR-0924 Visual Grading of Galvanised Line Hardware - OHEW	G1	M&R
2004	AM-PR-0924 Visual Grading of Galvanised Line Hardware - OPGW	G1	M&R

Both the OHEW and OPGW were replaced in 2004 and remain in good condition.



Condition of OHEW STR-1501

6.9 Earthwire & OPGW Hardware

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to Loss of 0.5mm
2004	AM-PR-0924 Visual Grading of Galvanised Line Hardware - OHEW	G1	M&R
2004	AM-PR-0924 Visual Grading of Galvanised Line Hardware - OPGW	G3*	M&R

Both replacement earth-wires have been suspended in new AGSUs and fitted with new tension hardware. All hardware is in a good condition.

*OPGW downlead clamps have Grade 3 bolt corrosion on all clamps and will require replacement in 5 – 7 years.

Condition of OHEW & OPGW Hardware on BS1257

6.10 Suspension Insulators

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1998, 2001	AM-PR-0499 Guide to Visual Inspection of Porcelain / Glass Insulation	G2 56%	M&R

The condition of the insulators on the suspension towers reflects their age and the line's location in North Queensland. Light pin corrosion (Grade 2) has been observed throughout the built section and periodic monitoring is required.

There is a mix of glass and porcelain insulation throughout the line that had been replaced in 1998 and 2001. SAP has replacements dates between 2021 and 2028, but based on the condition of the insulators, a service life of at least 15 years is remaining. Chinese porcelain insulation is listed in SAP as being installed in 1985, but it is possible that in some cases these insulators have been replaced and SAP has not been updated.

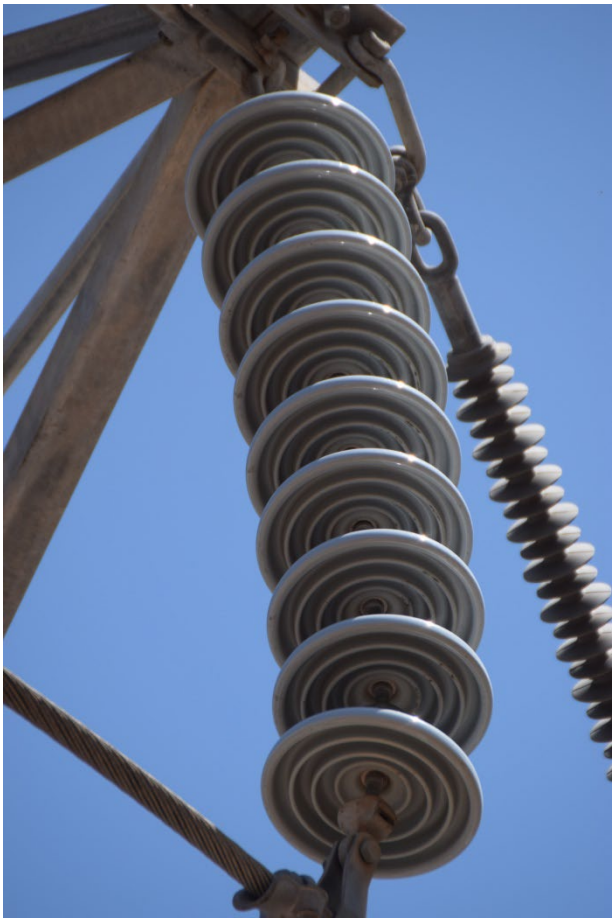
Glass Suspension Insulators STR-1482

6.10.1 Bridging Insulators and Hardware

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
2001, 2014	AM-PR-0499 Guide to Visual Inspection of Porcelain / Glass Insulation	G1	M&R
2001, 2014	AM-PR-0924 Visual Grading of Galvanised Line Hardware	G2 100%	M&R

Three structures contain bridging insulators which were changed under maintenance in 2001 and 2014 and are in good condition. All hardware associated with the bridging arrangements are the original hardware and Grade 2 corrosion is evident at all locations.

Bridging String STR-1043



6.11 Suspension Insulator Hardware

Year of Commissioning	Year of Commissioning	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0924 Visual Grading of Galvanised Line Hardware	G2 100%	M&R

Suspension insulator hardware remains in a sound condition with AGSUs used throughout the line. Grade 2 corrosion is found on both the hot and cold end hardware fittings, which is original installed throughout the built section.

The AGSUs are in good condition with little to no corrosion evident, however the AGSU bolt is beginning to show signs of early Grade 2 corrosion in some cases.

Suspension Hardware Condition on STR-1481

6.12 Tension Insulators

Year of Commissioning	Condition Assessment Criteria	Corrosion Grade	ET to loss of 0.5mm
1993, 2004, 2015	AM-PR-0499 Guide to Visual Inspection of Porcelain / Glass Insulation	G1	M&R

The tension structures in Built Section 1257 have a mix of porcelain insulators (installed in 1993) and composite longrods installed in 2004. Structure 1499 also had insulators replaced in 2015 under maintenance. All tension insulators are in good condition and have at least a further 15 years of service life remaining.

Tension Insulators STR-1499

6.13 Tension Insulator Hardware

Year of Commissioning	Year of Commissioning	Corrosion Grade	ET to loss of 0.5mm
1978	AM-PR-0924 Visual Grading of Galvanised Line Hardware	G2 71%	M&R

Hardware on all tension strings insulators was installed in 1978 and has Grade 2 corrosion throughout. The hardware is in fair condition and it is recommended that periodic monitoring continue.

Condition of Hardware on Tension Insulators STR-1497

6.14 Signage

Warning and asset identification signs are in sound condition and meet current Powerlink standards.

6.15 Easement

The easement poses no particular problems for the access of EWPs and stringing equipment.

That section from structures 1480 to 1499 is on Commonwealth owned land under the control of the Army. Entry restrictions apply.

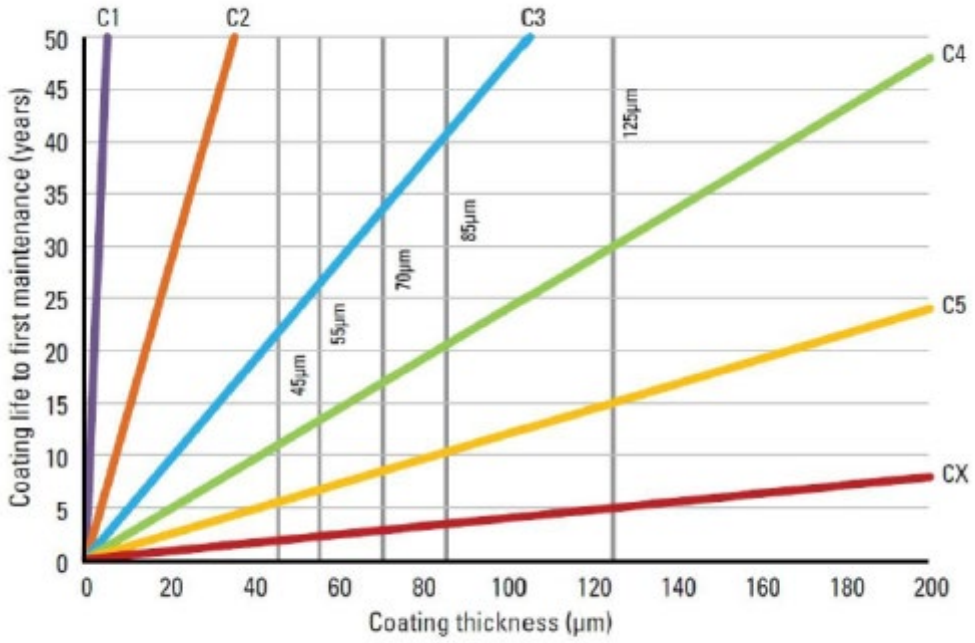
7.0 Appendices

7.1 Estimated Service Life of Galvanised Steel

Ross – STR-1043 (Dan Gleeson)

Corrosivity Category	Corrosivity	Example
C3	Medium	tropical zone 60 km inland with low pollution

Chart 1: Life to First Maintenance of Hot Dip Galvanized Steel

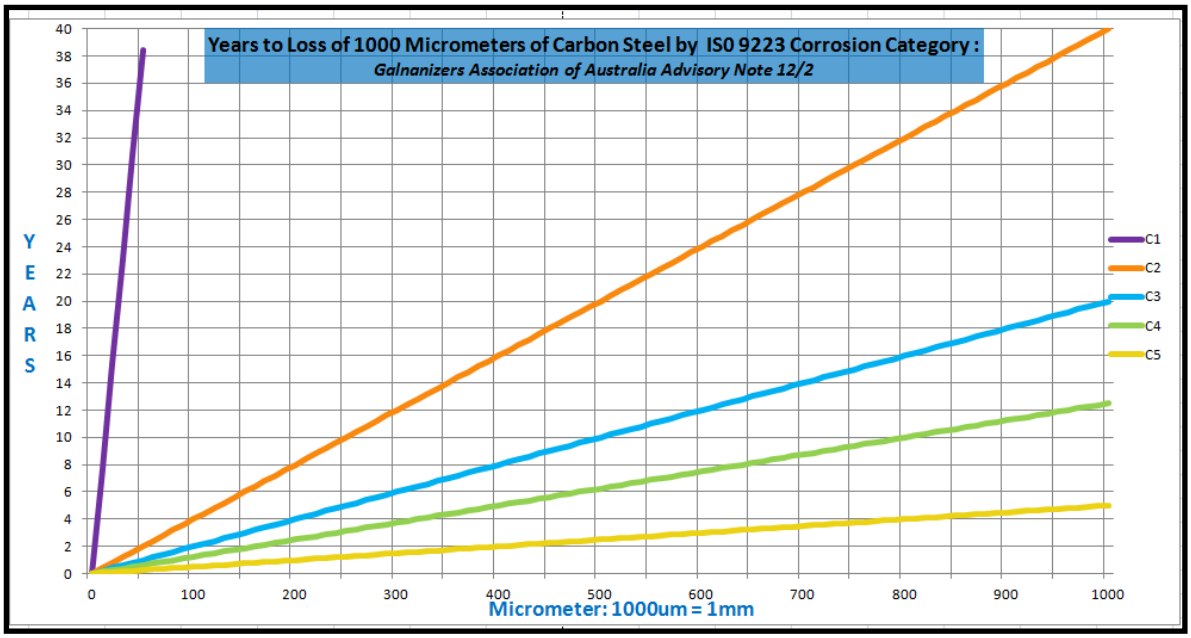


The LFM range for a particular hot dip galvanizing coating thickness and each corrosivity zone can be read from the chart. For example, the LFM range for a hot dip galvanized article with an 85 µm thickness and located in the C4 (High) corrosivity zone is 20 to 40 years.

This chart is supported by case history evidence in Australia, where service life records of 50 years are common and up to 110 years are recorded.

The Life to First Maintenance chart is available as a standalone document directly from the Galvanizers Association of Australia.

○ Estimated Service Life of Carbon Steel



Source: Extrapolated from Table 2: Corrosion Rates for Steel and Zinc for the first year of exposure for different corrosivity categories. Galvanizers Association of Australia – Advisory Note GEN12/2 April 2012

References

Inspection Guides and Corrosion Models

- AM-PR-0836 Visual Grading of Galvanised Members
- AM-PR-0835 Visual Grading of Galvanised Bolts
- AM-POL-0174 Maintenance of Structure Earthing
- AM-PR-0351 Maintenance of Conductors
- AM-PR-0924 Visual Grading of Galvanised Line Hardware
- AM-PR-0499 Guide to Visual Inspection of Porcelain / Glass Insulation
- AM-PR-1008 Vibration Dampers – In Service Inspection
- Galvanizers Association of Australia - Advisory Note GEN12/2 April 2012 *"Atmospheric Corrosion Resistance of Hot Dipped Galvanised Coatings"*

Built Section Configuration

- SAP Reports

  - B_SECT_DGN_Detail
  - SPAN_DOC_REF
  - EASEMENT DETAILS
  - SPAN_COND_DETAILS
  - SPAN_EWIRE_DTL
  - LINE_STR_DETAILS
  - LINE_STR_MAINT_DTL
  - STR_ACCESSORIES
  - LINE INSULATOR
  - FLOSS SHEETS

Condition Assessment Data

- Aeropower Transmission Pro
- SAP IK17 Measurement Documents

Planning Report	**25/03/2025**
Title	CP.02631 BS1257 Ross-Dan Gleeson Transmission Line Refit
Zone	Far North Queensland (FNQ)
Need Driver	Emerging operational and safety risks arising from the condition of the built sections BS1257(7144/1 and 7151/1).
Network Limitation	Necessary to meet Powerlink Queensland's N-1-50MW/600MWh Transmission Authority reliability standard.
Pre-requisites	None

Executive Summary

The Ross to Dan Gleeson 132kV transmission line consists of two built sections BS1257 and BS1614. BS1257 is exceeding 45 years of age and operates in a tropical environment which advances corrosion.

Removal of BS1257, which made up of feeder 7144/1 and 7151/1 to address emerging condition risks would result in Powerlink breaching its N-1-50MW/600MWh reliability obligations.

The preferred network solution for Powerlink to continue to meet its statutory obligations is refit the structures.

Table of Contents

1. Introduction

The Ross to Dan Gleeson 132kV transmission line was first established in 1979 as part of a 132kV transmission line from Collinsville Power Station to Garbutt Substation. It is a double circuit 132kV steel tower transmission line operating in a tropical environment. The line is nearing the end of its technical service life with the majority of structures exhibiting signs of degradation.

The Ross to Dan Gleeson double circuit 132kV transmission line consists of two built sections: BS1257 and BS1614. Both built sections form the circuits, 7144/1 and 7151/1.

Dan Gleeson 132kV is one of the main injection points into Townsville region to supply the Ergon Energy distribution network.

Figure 1 shows a geographical view of Dan Gleeson location within the Townsville area. The figure shows the existing 275kV, 132 kV and 66kV transmission networks in the area.

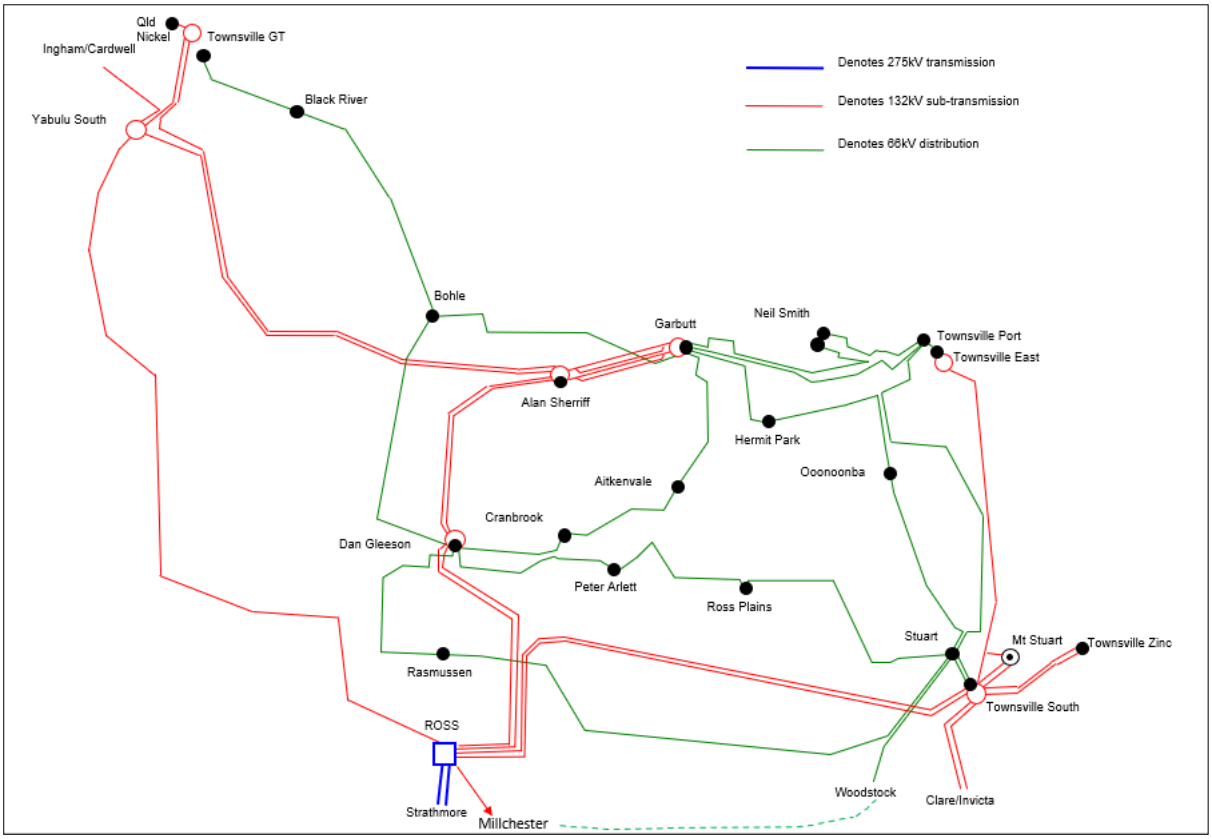


Figure 1. Geographical view of the Townsville transmission network

BS1257 was commissioned in 1978 and consists of 25 structures (7 tension, 16 suspension and 2 balanced strain). This built section is 9.9km in length and runs parallel to the Ross River. This section of the transmission line (BS1257) is exceeding 45 years of age and operates in a tropical environment which advances corrosion of the galvanised components of the structures.

The condition assessment [1] has concluded BS1257 is reaching the end of their operational life and recommends that action is taken to address the network and safety risks arising from the condition of the ageing plant.

This report assesses the impact that removal of the at-risk plant would have on the performance of the network and Powerlink's statutory obligations. It also establishes the

indicative requirements of any potential alternative solutions to the current services provided by the feeders 7144/1 and 7151/1.

2. Townsville Region Demand Forecast

Figure 2 shows how Dan Gleeson injects into the EQL 66kV network via 7144 and 7151 (in parallel with PLQ network), linking the EQL load of the Townsville Region, including Townsville South and East, Townsville South, Garbutt, and Dan Gleeson. These supply points 7144 and 7151 are directly impacted by the ageing assets in this report.

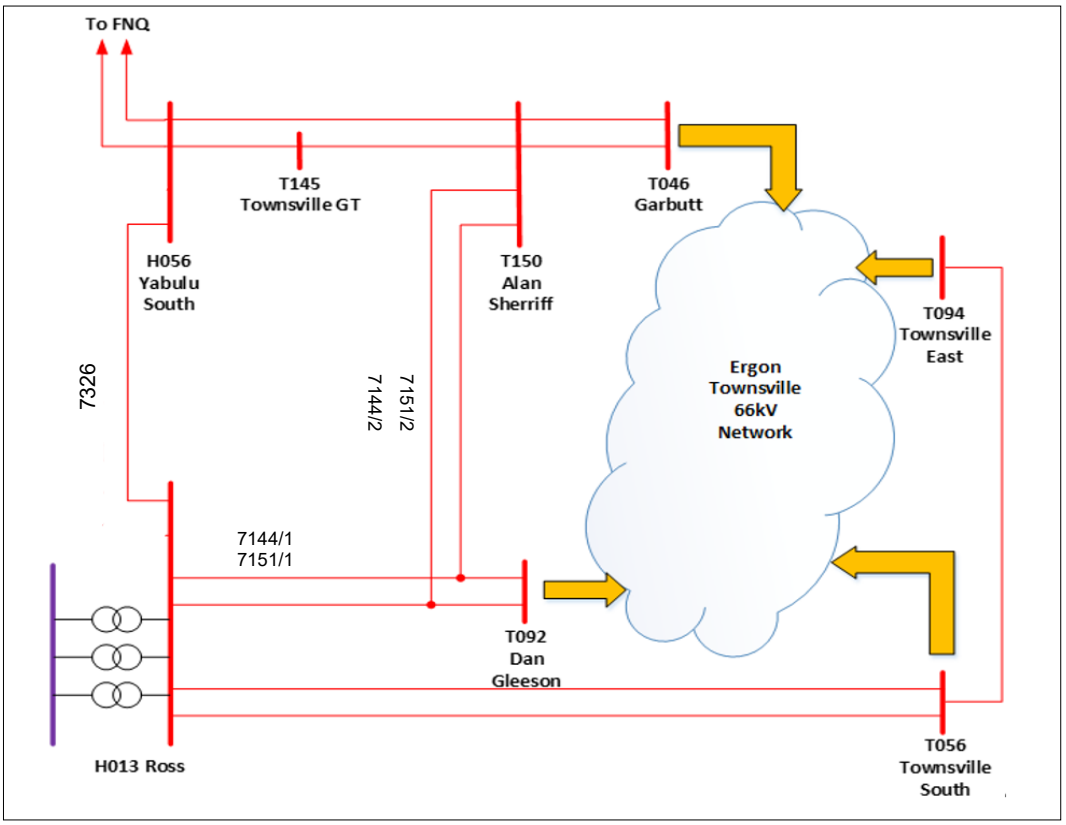


Figure 2. EQL network interface with PLQ Network

Figure 3 shows the steady increase in the Townsville demand supplied by EQL's 66kV network.

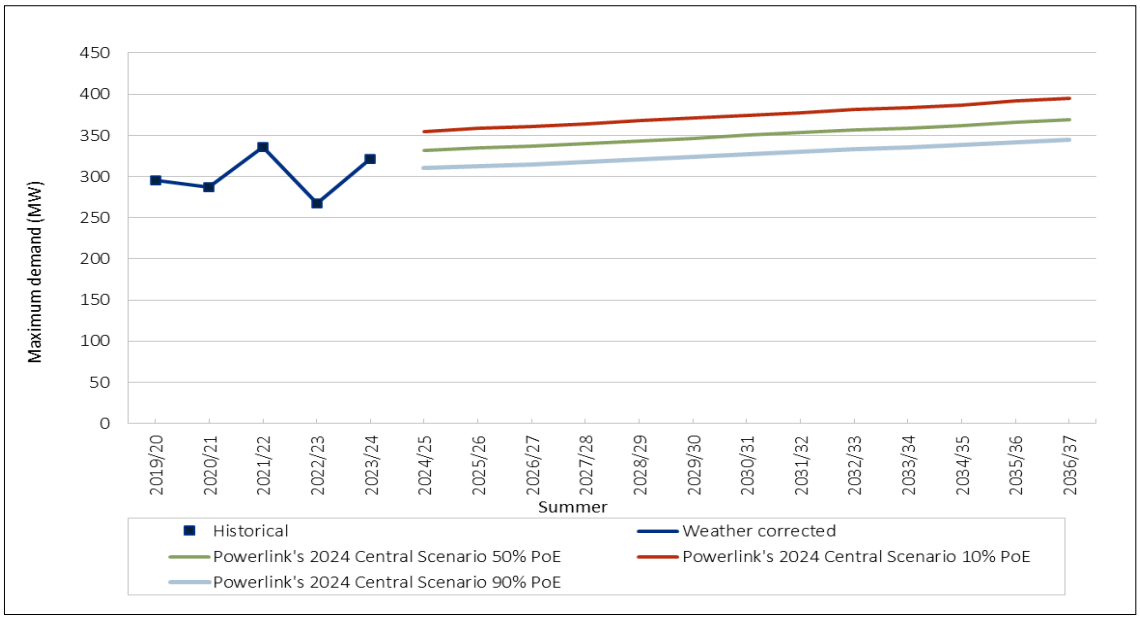


Figure 3. Load forecast for Townsville Region 66kV

Figure 4 below shows the historical peak demand and forecast maximum demand for local Dan Gleeson load. Both loads confirm an ongoing need for the 7144/1 and 7151/1 South substation.

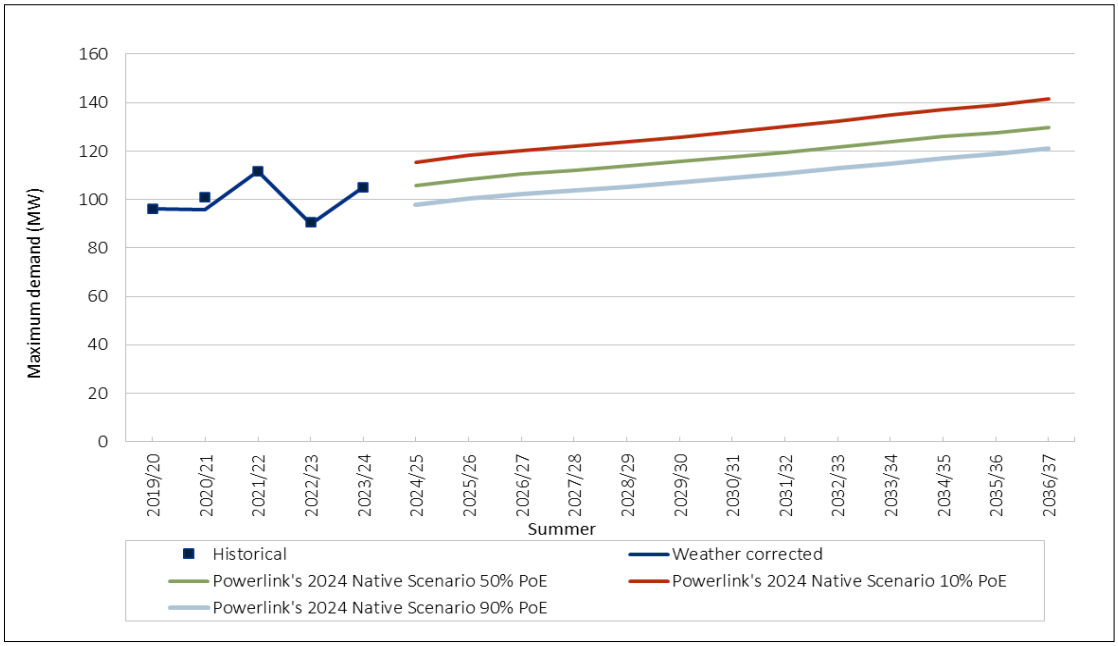


Figure 4. Load forecast for Dan Gleeson substation

3. Statement of Investment Need

Feeders 7144 and 7151 is the backbone to supply Dan Gleeson Substation which supports the Townsville region, as well as local load.

The failure to address the at-risk 7151/1 and 7144/1 would have a major impact on the performance of this network and the reliability of supply to associated loads, which would ultimately result in loss of load exceeding Powerlink's N-1-50MW / 600MWh Transmission Authority reliability standard.

4. Network Risk

Table 1 summarises the load and energy at risk connected to 132kV Townsville Region.

Appendix A describes the methodology and assessment against the reliability standard.

Table 1. Townsville Region Load at risk **(based on 2024 data)**

At Risk	Contingency	Metric	Townsville EQL load
EQL Load	loss of 7144/1 or 7151/1	Max (MW) > capacity limit	42
		Annual Average (MW) > capacity limit	0.05
		24h Max Energy Constrained (MWh)	127
		24h Average Energy Constrained (MWh)	1.2

At Risk	Contingency	Metric	Townsville EQL load
EQL Load	Structure collapse (loss of 7144/1 and 7151/1)	Max (MW) > capacity limit	133
		Annual Average (MW) > capacity limit	62
		24h Max Energy Constrained (MWh)	2227
		24h Average Energy Constrained (MWh)	1489

5. Non-Network Options

To address the impact of a failure of BS1257 that results in 2 feeder outage, non-network solutions would need to provide supply to Townsville EQL load up to 133MW and 2230MWh of energy each day, to maintain network security until the normal supply is restored.

Powerlink is not aware of any Demand Side Solutions (DSM) in the area supplied by Tully. However, Powerlink will consider any proposed solution that can contribute significantly to the requirements of ensuring that Powerlink continues to meet its required reliability of supply obligations as part of the formal RIT-T consultation process.

6. Network Options

6.1 Proposed network option to meet the identified need

Given the steadily slow growth load forecast at Townsville region and Dan Gleeson load, it is important to maintain supply to Dan Gleeson Substation from Ross substation.

The recommended network solution is to perform BS1257 transmission line refit. This option ensures that all reliability of supply and asset condition criteria are met.

Powerlink considers the proposed network solution will not have any material inter-network impact.

6.2 Option Considered but Not Proposed

This section discusses alternative options that Powerlink has investigated but does not consider technically and/or economically feasible to address the above identified issues and thus are not considered credible options.

6.2.1 Do Nothing

“Do Nothing” would not be an acceptable option as the primary drivers (primary system condition) and associated safety, reliability and compliance risks would not be resolved. Furthermore, the “Do Nothing” option would not be consistent with good industry practice and would result in Powerlink breaching their obligations with the requirements of the System Standards of the National Electricity Rules and its Transmission Authority.

6.2.2 Decommission all ageing assets in Dan Gleeson

Under this option it would be proposed to decommission the aging asset such as BS1257, feeder 7144/1 and 7151/1. As discussed, decommission ageing assets will result in loss of load and hence breach Powerlink’s N-1-50MW/600MWh reliability obligations. As such, this is not a viable option.

7. Recommendations

Powerlink has reviewed the condition of the built section BS1257 reaching end of technical service life.

Retaining BS1257 will allow Powerlink to continue to meet its required reliability obligations (N-1-50MW/600MWh) and maintain existing connection arrangements with directly connected generation and Industrial loads.

Powerlink is currently unaware of any feasible alternative options to minimise or eliminate the load at risk at Townsville region due to BS1257 but will, as part of the formal RIT-T consultation process, seek non-network solutions that can contribute to reduced overall investment needs whilst ensuring Powerlink continues to meet its reliability of supply obligations.

It is recommended that line refit be implemented to extend the life of BS1257.

8. References

1. BS1257 Ross to Dan Gleeson Condition Assessment Report
2. Project Scope Report CP.02631 Ross-Dan Gleeson BS1257 Transmission Line Refit, A5898097, 23/07/2025
3. 2025 Transmission Annual Planning Report (A6049612)
4. Asset Planning Criteria - Framework (ASM-FRA-A2352970)
5. Powerlink Queensland’s Transmission Authority T01/98

Appendix A – Network Risk methodology

Feeder 7144/1 OR 7151/1, to resecure for a contingency 7151 OR 7144

For loss of 7144/1 or 7151/1, network will land satisfactory. To resecure within next 30 minutes for the next contingency (e.g. trip of the parallel feeder), load reduction is required in Townsville region, if Townsville region demands is high, e.g. exceeding 260MW.

Feeder 7144/1 and 7151/1, to resecure for a contingency 7326

De-energising feeder 7144/1 and 7151/1 due to safety issue or tower collapsed result by the corrosive structures, would result overloading in EQL network and the network is not secure for the next contingency (e.g. trip of feeder 7326). To resecure the network within next 30 minutes, load reduction is required to reduce EQL demand and maintain security under any subsequent contingency as summarised in Table 1.

Project Scope Report

CP.02631

BS1257 Ross-Dan Gleeson Transmission Line Refit

Concept – Version 1

Document Control

Change Record

Issue Date	Revision	Prepared by	Reviewed by	Approved by	Background
27/6/2025	1	T Vu	[redacted]	[redacted]	Initial issue

Related Documents

Issue Date	Responsible Person	Objective Document Name
26/03/2015	[redacted]	BS1257 Ross to Dan Gleeson Condition Assessment Report 2015 (A2390590)
10/06/2025	[redacted]	Project Initiation Form - BS1257 Refit v2 (A5884199)

Document Purpose

The purpose of this Project Scope Report is to define the business (functional) requirements that the project is intended to deliver. These functional requirements are subject to Powerlink's design and construction standards and prevailing asset strategies, which will be detailed in documentation produced during the detailed scoping and estimating undertaken by DTS (or OSD), i.e. it is not intended for this document to provide a detailed scope of works that is directly suitable for estimating.

Project Contacts

Project Sponsor	[redacted]
Connection & Development Manager	TBA
Strategist – Lines Asset Strategies	[redacted]
Planner – Main/Regional Grid	[redacted]
Manager Projects	[redacted]
Project Manager	TBA
Design Manager	TBA

Project Details

1. Project Need & Objective

The Ross – Dan Gleeson 132kV transmission line consists of two built sections BS1257 and BS1614 and is made up of feeders 7144/1 and 7151/1.

BS1257 was commissioned in 1978 and consists of 25 structures (7 tension, 16 suspension and 2 balanced strain). This built section is 9.9km in length and runs parallel to Ross River. It is approximately 15km from the coastline, however it is largely sheltered from coastal winds by the local topography. The geographical location of the built section is shown in Figure 1 below.

This section of the transmission line (BS1257) is exceeding 45 years of age and operates in a tropical environment which advances corrosion of the galvanised components of the structures. Earlier condition assessments in 2015 referred to the onset of G3 corrosion throughout the built section, although only one structure (STR-1043) currently has a health index above 8 as of 2024. By 2029, the number of structures with a HI above 8 will increase to 5 and if no remediation is undertaken there will be 17 by 2035.

The objective of this project is to carry out targeted refit works to extend the service life of BS1257 for a further 15 years.

2. Project Drawing

Figure 1: Geographical Location of BS1257

3. Deliverables

The following deliverables are to be provided in response to this Project Scope Report. The requirement dates for these deliverables will be communicated separately.

This project will follow the two-stage approval process. The following deliverables are to be provided for the purposes of Revenue Reset:

1. A report (e.g. Concept Estimate Report) detailing the works to be delivered, high level staging, resource requirements and availability, and outage requirements and constraints for each option.

2. A class 5 estimate (minimum) for each option.

3. A basis of estimate document and risk table, detailing the key estimating assumptions and delivery risks for each option.

4. Project Scope

The following scope presents a functional overview of the desired outcomes of the project. The proposed solution presented in the estimate must be developed with reference to the remaining sections of this Project Scope Report, in particular S*ection 6 - Special Considerations*.

Briefly, the project consists of undertaking selective refit of BS1257 Ross-Dan Gleeson transmission line to extend its service life.

Two credible options have been identified to refit BS1257, as presented in Table 1 below. These options will be presented in the RIT-T public consultation. Concept estimates are required for each option to inform feasibility and cost assessments.

Table 1 - Options summary

Option	Stage	Works	Comm. Date
1	1	Refit of all G3 or above bolts and members, replacement of step bolts, repair of foundations and upgrade of anti-climb barriers for the 18 structures listed in Attachment 1.	June 2031
2	1	Refit structures with a Health Index of 8 or higher (assume 5 structures as per Attachment 1), including the replacement of all G3 and G4 bolts and members, repair of foundations and earthing and upgrading of anti-climb barriers where required. The refit of the remaining structures will be deferred until their respective Health Index reaches 8 in future regulatory periods, in line with the Asset Reinvestment Review.	June 2031
	2*	Refit structures with a Health Index of 8 or higher (assume 16 structures as per Attachment 1), including the replacement of all G3 and G4 bolts and members, repair of foundations and earthing and upgrading of anti-climb barriers where required. **Note: Stage 2 will be carried out under a separate project in the subsequent regulatory period. However, estimation of both stages are required to enable economic assessments to determine the preferred option*	June 2036

4.1. Option 1 – Refit BS1257 by 2031

4.1.1. Transmission Line Works

Undertake transmission line refit works on Built Section 1257 as follows:

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP;
- Upgrade climbing attachments and step bolts to current standard;

- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For estimation purposes assume an average of approximately 30% of fasteners and 1% of members on 18 of the 23 structures as listed in Attachment 1;
- Repair foundation interfaces of affected structures where required (assume 5%);
- Measure structure footing resistance of affected structures and upgrade where required (assume 10%);
- Repair/replace anticlimbing barriers of affected structures where required (assume 10%); and
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

4.2. Option 2 – Staged Refit of BS1257

4.2.1. Transmission Line Works

Undertake staged transmission line refit works on built section BS1257 as follows:

Stage 1 by 2031

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP;

For structures with a Health Index of 8 or higher (assume 5 structures for estimating purposes as listed in Attachment 1):

- Upgrade climbing attachments and step bolts to current standard;
- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For estimation purposes assume an average of approximately 30% of fasteners and 1% of members on 5 structures (refer Attachment 1);
- Repair foundation interfaces of affected structures where required (assume 5%);
- Measure structure footing resistance of affected structures and upgrade where required (assume 10%);
- Repair/replace anticlimbing barriers of affected structures where required (assume 10%); and
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

Stage 2 by 2036

For structures with a Health Index of 8 or higher (assume 16 structures for estimating purposes as listed in Attachment 1):

- Upgrade climbing attachments and step bolts to current standard;

- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For estimation purposes assume an average of approximately 30% of fasteners and 1% of members on 16 structures (refer Attachment 1);
- Repair foundation interfaces of affected structures where required (assume 5%);
- Measure structure footing resistance of affected structures and upgrade where required (assume 10%);
- Repair/replace anticlimbing barriers of affected structures where required (assume 10%); and
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

4.2.2. Substation Works

Not applicable

4.2.3. Telecoms Works

Not applicable

4.2.4. Easement/Land Acquisition & Permits Works

The transmission line is on existing Powerlink easements. Site access shall be reviewed for project work and include:

- Review of easement terms and conditions to confirm the works to be undertaken can be completed under the easement conditions;
- Undertaking a desktop review to identify any sites of cultural heritage significance; and
- Securing any additional approvals or permits required to complete the project.

4.3. Key Scope Assumptions

The following assumptions should be included in the estimating of this scope:

- Nominal replacement quantities have been assumed for estimating purposes.

5. Project Timing

5.1. Project Approval Date

The anticipated date by which the project will be approved is 31 December 2029.

5.2. Site Access Date

The built section is an existing Powerlink asset. Site access for construction works is already available.

5.3. Commissioning Date

The latest date for the commissioning of the new assets included in this scope is 30 June 2031 for Option 1 and 30 June 2036 for Option 2.

6. Special Considerations

Not applicable.

7. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

The Project Sponsor must be included in any discussions with any other areas of Network and Business Development including Asset Strategies & Planning.

Business Development will provide the primary customer interface. The Project Sponsor should be kept informed of any discussions with the customer.

8. Asset Ownership

The works detailed in this project will be Powerlink Queensland assets.

9. System Operation Issues

Operational issues that should be considered as part of the scope and estimate include:

- interaction of project outage plan with other outage requirements;
- likely impact of project outages upon grid support arrangements; and
- likely impact of project outages upon the optical fibre network.

10. Options

Not applicable

11. Division of Responsibilities

Not applicable

12. Related Projects

No related projects

Attachment 1: List of Structures for Refit Works

OPTION 1: Structure Refit 2031

FUNCTIONAL LOCATION	DESCRIPTION
1257-STR-1043	STRUCTURE A60R-3
1257-STR-1480	STRUCTURE LDAM/T+0
1257-STR-1481	STRUCTURE LDSH+3
1257-STR-1482	STRUCTURE LDSH+6
1257-STR-1487	STRUCTURE LDSL+0
1257-STR-1488	STRUCTURE LDSL-3
1257-STR-1489	STRUCTURE LDSL-3
1257-STR-1490	STRUCTURE LDSL-3
1257-STR-1491	STRUCTURE LDSL+0
1257-STR-1492	STRUCTURE LDSL+3
1257-STR-1493	STRUCTURE LDSL-6
1257-STR-1494	STRUCTURE LDSL+0
1257-STR-1495	STRUCTURE LDSH-3
1257-STR-1496	STRUCTURE LDSH+3
1257-STR-1497	STRUCTURE LDAM-3
1257-STR-1498	STRUCTURE LDAM+6
1257-STR-1499	STRUCTURE LDAM+0
1257-STR-1500	STRUCTURE LDAM+3

OPTION 2: Stage 1 – Structure Refit 2031

FUNCTIONAL LOCATION	DESCRIPTION
1257-STR-1043	STRUCTURE A60R-3
1257-STR-1480	STRUCTURE LDAM/T+0
1257-STR-1497	STRUCTURE LDSH+3
1257-STR-1498	STRUCTURE LDSH+6
1257-STR-1499	STRUCTURE LDSL+0

OPTION 2: Stage 2 – Structure Refit 2036

FUNCTIONAL LOCATION	DESCRIPTION
1257-STR-1481	STRUCTURE LDSH+3
1257-STR-1482	STRUCTURE LDSH+6
1257-STR-1483	STRUCTURE LDSL+0
1257-STR-1484	STRUCTURE LDSL-3
1257-STR-1486	STRUCTURE LDSH+3
1257-STR-1487	STRUCTURE LDSL+0
1257-STR-1488	STRUCTURE LDSL-3
1257-STR-1489	STRUCTURE LDSL-3
1257-STR-1490	STRUCTURE LDSL-3
1257-STR-1491	STRUCTURE LDSL+0
1257-STR-1492	STRUCTURE LDSL+3
1257-STR-1493	STRUCTURE LDSL-6
1257-STR-1494	STRUCTURE LDSL+0
1257-STR-1495	STRUCTURE LDSH-3
1257-STR-1496	STRUCTURE LDSH+3
1257-STR-1500	STRUCTURE LDAM+3

CP.02631 Ross-Dan Gleeson BS1257 Transmission Line Refit

Concept Estimate

Table of Contents

1. Executive Summary

This Concept Estimate document is based on the CP.02631 Ross-Dan Gleeson BS1257 Transmission Line Refit Project Scope Report (PSR).

The Ross – Dan Gleeson 132kV transmission line consists of two Built Sections BS1257 and BS1614 and is made up of feeders 7144/1 and 7151/1.

BS1257 was commissioned in 1978 and consists of 25 structures (7 tension, 16 suspension and 2 balanced strain). This built section is 9.9km in length and runs parallel to Ross River. It is approximately 15km from the coastline, however it is largely sheltered from coastal winds by the local topography.

This section of the transmission line (BS1257) is exceeding 45 years of age and operates in a tropical environment which advances corrosion of the galvanised components of the structures. Earlier condition assessments in 2015 referred to the onset of G3 corrosion throughout the built section, although only one structure (STR-1043) currently has a health index above 8 as of 2024. By 2029, the number of structures with a HI above 8 will increase to 5 and if no remediation is undertaken there will be 17 by 2035.

Two credible options have been identified for refitting BS1257 as below:

1	1	Refit of all G3 or above bolts and members, replacement of step bolts, repair of foundations and upgrade of anti-climb barriers for the 18 structures.
2	1	Refit structures with a Health Index of 8 or higher (assume 5 structures as per Attachment 1), including the replacement of all G3 and G4 bolts and members, repair of foundations and earthing and upgrading of anti-climb barriers where required. The refit of the remaining structures will be deferred until their respective Health Index reaches 8 in future regulatory periods, in line with the Asset Reinvestment Review.
	2	Refit structures with a Health Index of 8 or higher (assume 16 structures as per Attachment 1), including the replacement of all G3 and G4 bolts and members, repair of foundations and earthing and upgrading of anti-climb barriers where required.

The objective of this project is to carry out targeted refit works to extend the service life of BS1257 by 15 years.

The assessment in this proposal has established that the project can be delivered by September 2030 for Option 1 and September 2035 for Option 2.

The project will follow the two (2) stage approval process.

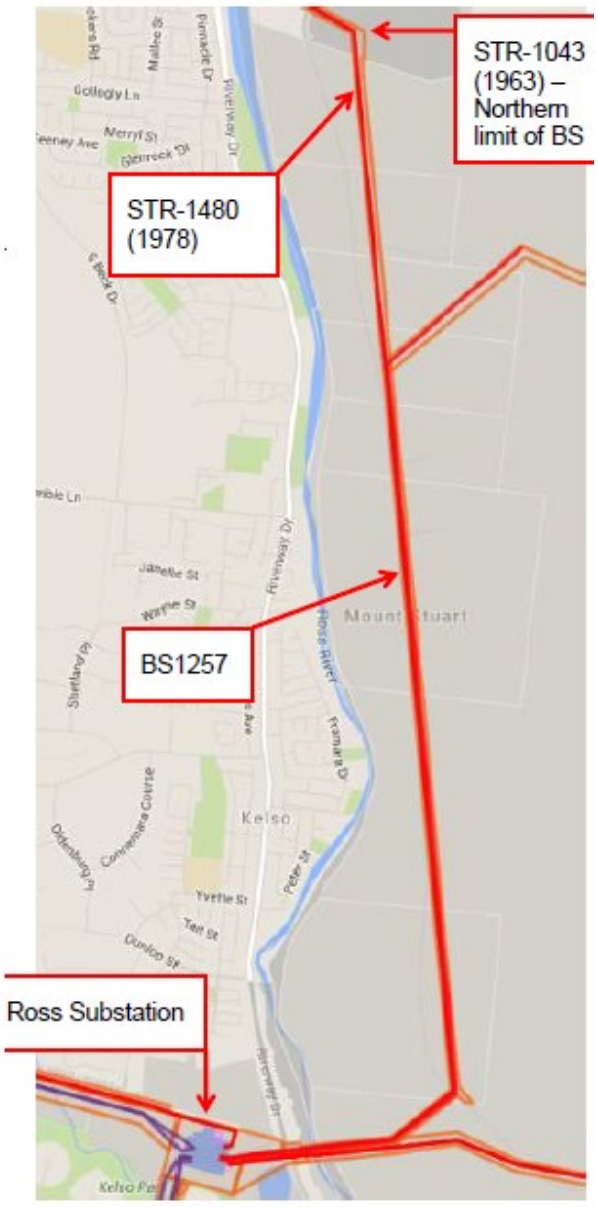


Figure 1 - Geographical location of BS1257

1.1 Project Estimate

No escalation costs have been considered in this estimate.

1.1.1 Option 1 - Single Stage Refit BS1257

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		5,473,421
TOTAL		**5,473,421**

1.1.2 Option 1 - Project Financial Year Cash Flows

DTS Cash Flow Table	Un-Escalated Cost ($)
To June 2028	193,556
To June 2029	211,152
To June 2030	1,208,946
To June 2031	3,844,121
To June 2032	15,646
TOTAL	**5,473,421**

1.1.3 Option 2 - Staged Refit BS1257

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		7,815,547
TOTAL		**7,815,547**

1.1.4 Option 2 - Project Financial Year Cash Flows

DTS Cash Flow Table	Un-Escalated Cost ($) Stage 1	Un-Escalated Cost ($) Stage 2	Total Un-Escalated Cost ($)
To June 2028	133,102	0	133,102
To June 2029	145,202	0	145,202
To June 2030	2,658,367	0	2,658,367
To June 2031	482,933	0	482,933
To June 2032	12,846	0	12,846
To June 2033	0	0	0
To June 2034	0	243,174	243,174
To June 2035	0	3,727,985	3,727,985
To June 2036	0	411,937	411,937
TOTAL	**3,432,451**	**4,383,096**	**7,815,547**

2. Project and Site-Specific Information

2.1 Project Dependencies & Interactions

This project is related to the following projects:

- No projects identified.

2.2 Site Specific Issues

- The transmission line is located in the greater Townsville urban area between Powerlink's H013 Ross and T092 Dan Gleeson Substations. This built section is 8.9km in length and runs parallel to the Ross River. It is approximately 15km from the coastline, however it is largely sheltered from coastal winds by the local topography.
- The site is likely subject to seasonal wet weathers, generally December to March each year.
- The project site is an existing asset and will be subject to the standard maintenance-oriented conditions and controls, i.e. weed wash downs, property access notifications.
- Majority of the structures are located on Defence Force Property. Entry Restrictions Apply. The easement poses no problems for the access of Environmental Work Plan (EWPs) and stringing equipment.
- This BS has Bio-security alert regarding Foot and Mouth disease (FMD). No access to farms or livestock areas for 7 days following travel to FMD-impacted areas.
- Paint used at the base of tower legs up to 1m from the ground contains asbestos. Treatment is required prior to repair work being carried out.
- The Townsville area is subject to the following average number of days of rain. Consideration was given to this when developing the project schedule.

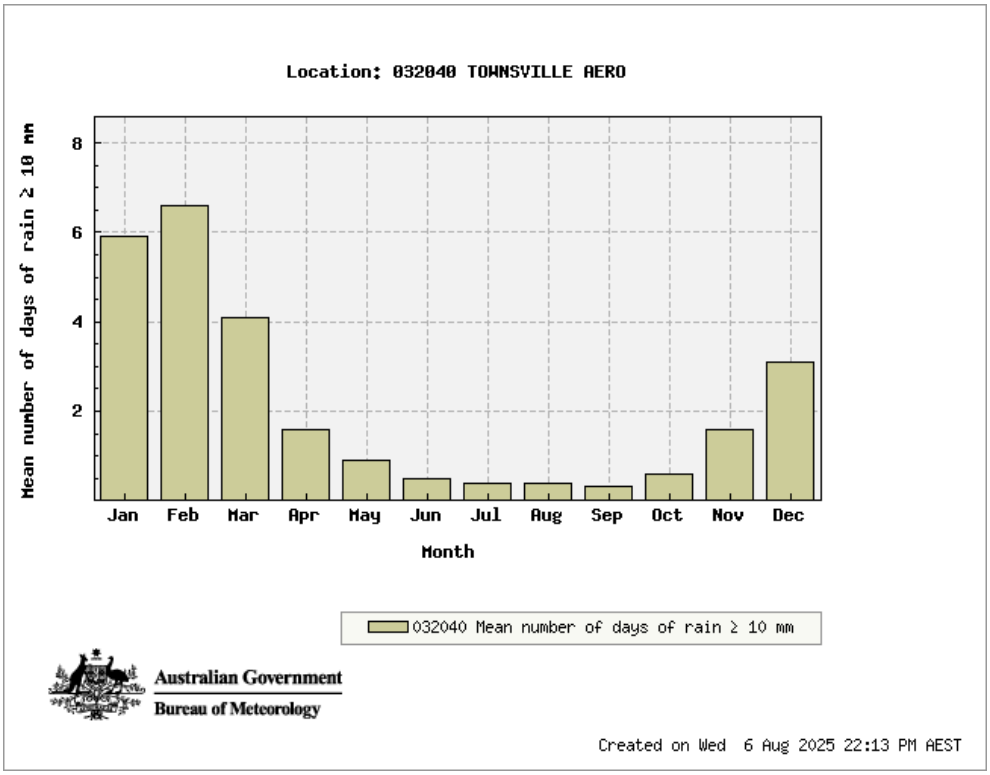


Figure 2 - Number of Days of Rain >10mm Townsville (Source: Bureau of Meteorology 6th August 2025)

3. Project Scope

The Project Scope involves transmission line refit works on Built Section 1257, 132kV circuit line between Ross and Dan Gleeson. The scope will also involve aspects of vegetation management, access track repair, biosecurity management, cultural heritage assessment and landholder relations to enable the required refit works.

3.1 Major Scope Assumptions

It is assumed that:

- No substantial new clearing or significant new access works required.
- Line refit scope will be performed by a Line Refit Contractor.
- Suitable outage/s will be available during non-peak load periods i.e. April to December.
- Access to site will be available at project approval.
- Any existing paints on structures (other than those specifically mentioned) are free of any hazardous materials i.e. lead, asbestos, etc.
- Biosecurity issues could occur during delivery i.e. weeds.
- Climbing of towers will be undertaken without outages, where possible and in accordance with safety procedures.

3.2 Scope Exclusions

- Any damage caused by extreme weather events, i.e., cyclone, major floods, or major bushfire.
- Logistical issues due to geopolitical tension/conflicts.
- Time and cost for Design, Planning and Implementation of any restoration plans required for outages is not included in this estimate.
- Delays to the delivery as a result of access constraints.

3.3 Easement/Land Acquisition & Permit Works

The transmission line is on existing Powerlink easements. Site access shall be reviewed for project work and include:

- Review of easement term and conditions to confirm the works to be undertaken can be completed under the easement conditions.
- Undertake a desktop review to identify if the wet tropics permit is current.
- Undertake a desktop review to identify any sites of cultural heritage significance.
- Secure any additional approvals or permits required to complete the project.

Estimated cost of the above activities including Environmental Compliance, Safety Compliance, SAHVEA (Safe Access to High Voltage Electrical Apparatus) training and compliance have been included in the project cost estimate.

3.4 Option 1 – Single Stage Refit BS1257

The following works have been costed for in the estimate, 18 structures all together.

3.4.1 Transmission Line Works

Undertake transmission line refit works on Built Section 1257 as follows:

- Perform a full Line Asset Measuring Points (LAMP) and condition assessment of all structures to inform scope and provide measuring point data for input into SAP.
- Upgrade climbing attachments and step bolts to current standard (30% of step bolts or 1080 step bolts and 3600 fall arrest brackets).
- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For estimation purposes assume an average of approximately 30% of fasteners (5940 fasteners) and 1% of members (59 members) on 18 of the 23 structures.
- Repair foundation interfaces of affected structures (5% or 2 foundations).
- Measure structure footing resistance of affected structures and upgrade (10% or 2 structures).
- Repair/replace anticlimbing barriers of affected structures (10% or 2 structures).
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

3.5 Option 2 – Staged Refit BS1257

The following works have been costed for in the estimate. 5 structures in Stage 1 and 16 Structures in stage 2.

3.5.1 Transmission Line Works

Undertake staged transmission line refit works on built section BS1257 as follows:

Stage 1 (5 Structures):

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP.

For structures with a Health Index of 8 or higher (assumed 5 structures for estimating purposes):

- Upgrade climbing attachments and step bolts to current standard (30% of step bolts or 300 step bolts and 1000 fall arrest brackets).
- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For an average of approximately 30% of fasteners (1650 fasteners) and 1% of members (17 members) on 5 structures.
- Repair foundation interfaces of affected structures (5% or 2 foundations).
- Measure structure footing resistance of affected structures and upgrade where required (10% or 1 structure).
- Repair/replace anticlimbing barriers of affected structures where required (10% or 1 structure).
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

Stage 2 (16 Structures):

For structures with a Health Index of 8 or higher (assumed 16 structures):

- Upgrade climbing attachments and step bolts to current standard (30% of step bolts or 960 step bolts and 3200 fall arrest brackets).

- Replace tower members and fasteners that are either damaged or have G3 corrosion and above. For an average of approximately 30% of fasteners (5280 fasteners) and 1% of members (52 members) on 16 structures.
- Repair foundation interfaces of affected structures where required (5% or 2 foundations).
- Measure structure footing resistance of affected structures and upgrade (10% or 2 structures).
- Repair/replace anticlimbing barriers of affected structures where required (10% or 2 structures).
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

4. Project Execution

4.1 Project Schedule

4.1.1 Option 1 - Single Stage Refit BS1257

This project will follow the two (2) stage approval process.

A high-level Project Schedule has been developed for the project stages:

Milestones	High-Level Timing
Undertake Condition Assessment	October 2027 – November 2027
Request for Class 3 Estimate	June 2028
Class 3 Project Proposal Submission	December 2028
RIT-T (assumed 9 months)	December 2028 – August 2029
Project Development Phase 1 & Phase 2	December 2028 – October 2029
ITT Submission (8 Weeks)	September 2029 – November 2029
Evaluate Tender, Reconcile Estimate and Submit PMP for Stage 2 Approval	November 2029
Stage 2 Approval (PAN2)	December 2029
Execute Delivery (including award of Line Refit contract)	December 2029
Line Refit Contractor Works	May 2030 – August 2030
Project Commissioning	September 2030

4.1.2 Option 2 - Staged Refit BS1257

This project will follow the two (2) stage approval process.

A high-level Project Schedule has been developed for the project stages:

Milestones	High-Level Timing
Undertake Condition Assessment	October 2027 – November 2027
Request for Class 3 Estimate	June 2028
Class 3 Project Proposal Submission	December 2028
RIT-T (assumed 9 months)	December 2028 – August 2029
Project Development Phase 1 & Phase 2	December 2028 – October 2029
ITT Submission (8 Weeks)	September 2029 – November 2029
Evaluate Tender, Reconcile Estimate and Submit PMP for Stage 2 Approval	November 2029
Stage 2 Approval (PAN2)	December 2029
Execute Delivery (including award of Line Refit contract)	December 2029
Line Refit Contractor Works Stage 1	May 2030 – July 2030
Line Refit Contractor Works Stage 2	May 2035 – July 2035
Project Commissioning	September 2035

4.2 Network Impacts

No major restrictions on outages but there may be some limitations present during the high load periods.

These works will require suitable outages to allow the works to be undertaken without any major outage constraints.

4.3 Project Staging

The project scope of works can be carried out in 2 stages:

Stage	Description/Tasks
1	Climbing and aerial inspection of BS1257 by a Line Refit Contractor or MSP
2	Line refit works by a Line Refit Contractor.

4.4 Resourcing

Design for the project will be completed by internal design resources with support from external design partners. The construction works will be completed by a combination of the Maintenance Service Providers and Line Refit contractors.

5. Project Asset Classification

5.1 Option 1 - Single Stage Refit BS1257

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	0
Substation Secondary Systems including New Building and associated civil works	-	0
Telecommunications	-	0
Overhead Transmission Line	5,473,421	100
TOTAL	**5,473,421**	**100**

5.2 Option 2 - Staged Refit BS1257

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	0
Substation Secondary Systems including New Building and associated civil works	-	0
Telecommunications	-	0
Overhead Transmission Line	7,815,547	100
TOTAL	**7,815,547**	**100**

6. References

Document name and hyperlink	Version	Date
Project Scope Report	1.0	27 June 2025

Risk Cost Summary Report

CP.02631

BS1257 Ross-Dan Gleeson Transmission Line Refit

Document Control

Change Record

Issue Date	Revision	Prepared by
19/01/2026	1.0	Asset Strategies

Related Documents

Issue Date	Responsible Person	Objective Document Name

Document Purpose

The purpose of this model is to quantify the base case and option risk cost profiles for the structures on the Ross - Dan Gleeson 275kV transmission line (BS1257), which is proposed for a refit under CP.02631. These risk cost profiles are then included as part of an overall cost-benefit analysis (CBA) to understand the economic benefit of the proposed upgrades. This process provides a benchmarking and internal gate process to support Powerlink in effectively identifying prioritised infrastructure upgrades.

The CBA was designed to demonstrate and quantify the value to be gained through specific infrastructure investment. To evaluate the CBA, an NPV is derived based on the present values of costs and benefits. The flow chart in Figure 4 below designates the methodology used in designing the CBA process.

Key Assumptions

In calculating the risk cost arising from a failure of the ageing structures on the Ross to Dan Gleeson, the following modelling assumptions have been made:

- The capability of the structures to perform their function is assumed to decay according to decay curves calculated by Powerlink, and associated probability of failure (PoF).
- The health of structures with no condition data has been imputed from the known condition of nearby structures.
- Where structures in scope are refit, post project the structure's Health Index (HI) reverts to a HI such to meet a 15-year life extension beyond the original economic life.
- For the purposes of the cost-benefit analysis, the refit will extend the service life of BS1257 by a further 15 years.
- A feeder-specific value of customer reliability (VCR) of $ 26,828/MWh has been applied when calculating network risks.
- The consequence of Bushfire Risk was modelled by the FLARE Wildfire Research Group at The University of Melbourne as part of Project IGNIS.

Base Case Risk Analysis

Risk Categories

Four main categories of risk are assessed as part of this project as consistent with Powerlink's Asset Risk Management Framework:

- Financial Risk
- Safety Risk
- Network Risk (including market impact if applicable)
- Environmental / Bushfire

Risk Category	Failure Types	Equipment in scope
Safety Risk	Structural / Mechanical/ failure	All equipment
	Electrical Failure	All equipment with the potential to fail electrically
Financial Risk	Structural / Mechanical failure	All equipment
	Electrical Failure	All equipment with the potential to fail electrically
Network Risk	Structural / Mechanical failure	All equipment
	Electrical Failure	All equipment with the potential to fail electrically
Environmental Risk	Structural / Mechanical failure	All equipment
	Electrical Failure	All equipment with the potential to fail electrically
Bushfire Risk	Structural / Mechanical failure	All equipment
	Electrical Failure	All equipment with the potential to fail electrically

Table 1: Risk Categories

Base Case Risk Cost

The modelled and extrapolated total base case risk costs are shown in Figures 1 and 2 below.

Risk costs associated with the equipment in scope are expected to increase from $0.42 million in 2026 to $9.93 million by the end of the 2027-32 regulatory period. Key highlights of the analysis include:

- Network risk is the predominant risk for this project due to all structures being a single point of failure for both Ross – Dan Gleeson feeders 7144/1 and 7151/1.
- Financial risks make up roughly 4% of total risk, mainly due to emergency restoration expenses from structural failures and third-party damages.
- Safety risks comprise about 4% of the total risk.
- Bushfire risk has been calculated and is immaterial to the overall base case risk.

Figure 1: Total Risk Cost

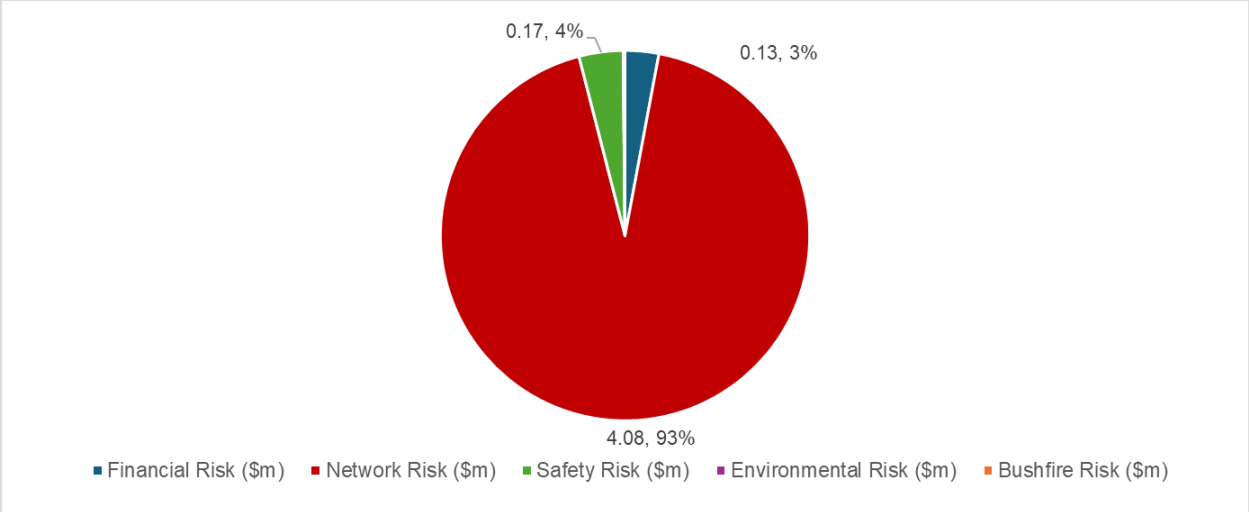


Figure 2: Base Case Rick Cost Contributions (2030)

Option Risk Cost

For modelling purposes, the refit of structures on BS1257 Ross – Dan Gleeson transmission line reduces effective HI scores to 5.3, lowering its probability of failure and therefore risk cost. For the transmission line refit activities, a life extension of 15 years has been considered in the model.

The figures below set out the total project case risk cost, and associated risk cost savings incremental to the base case.

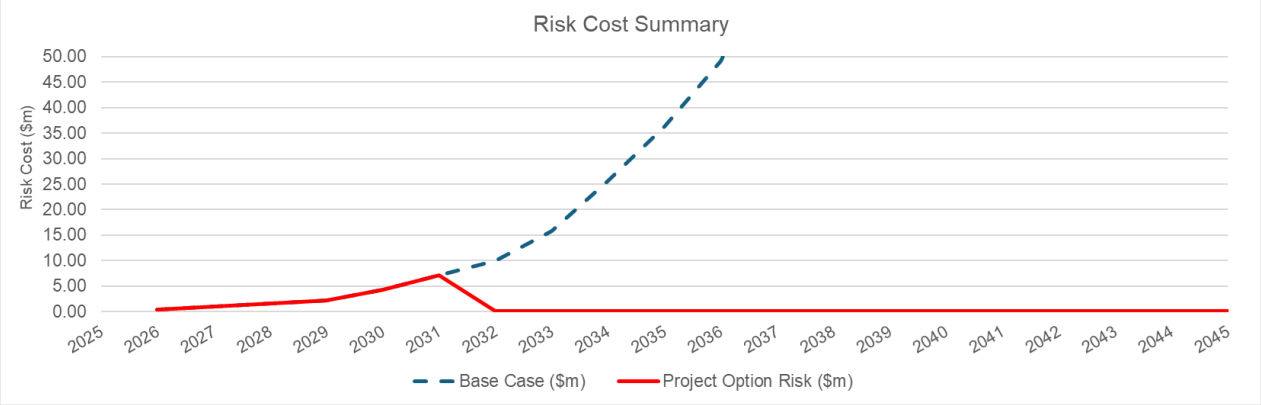


Figure 3: Project Option Risk Cost

Following the year of investment (2031) the risk cost associated with the equipment in scope effectively reduces to $0.11m. By 2047, the annualised risk cost of the project option is approximately $0.29 million, compared with the annualised base case risk cost of $658.18 million.

Cost Benefit Analysis

The methodology designed for the cost benefit is set out as per Figure 4 below.

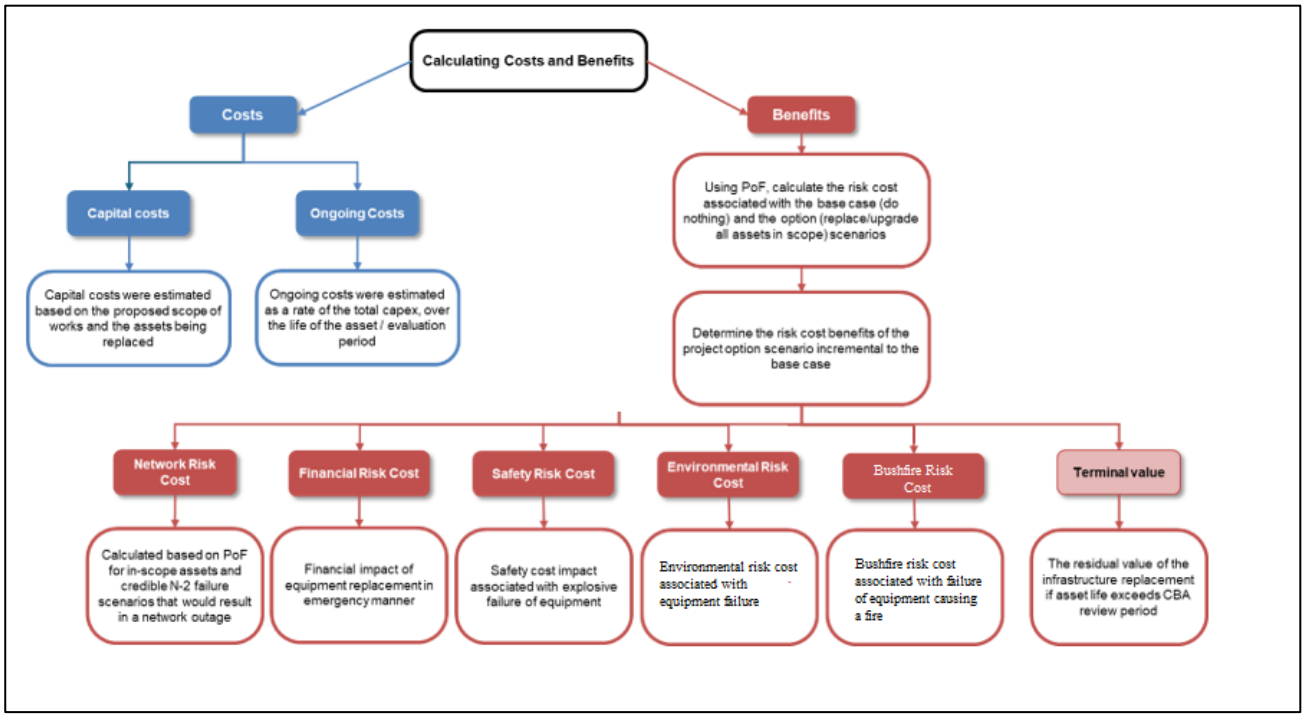


Figure 4: CBA Methodology

The project is estimated to cost approximately $5.47million. This represents a significant cost saving over the estimated financial risk cost of replacing assets individually in an emergency manner, due to the efficiencies associated with planned upgrades.

Based on a baseline discount factor of 7%, the project has a net present value (NPV) of $1024.1 million over a 15-year period, and a benefit-cost ratio (BCR) >10.

The project also has a positive NPV and BCR when a discount factor of 10% is applied.

Given this, replacement of the nominated assets within this project is considered appropriate.

		Present Value Table ($m)		
Discount rate	**%**	**3%**	**7%**	**10%**
NPV of Net Gain/Loss	$m	$2,035.5	$1,024.1	$629.0
Benefit-Cost Ratio	ratio	>10	>10	>10

Table 2: Net Present Value and Optimal Year of Investment

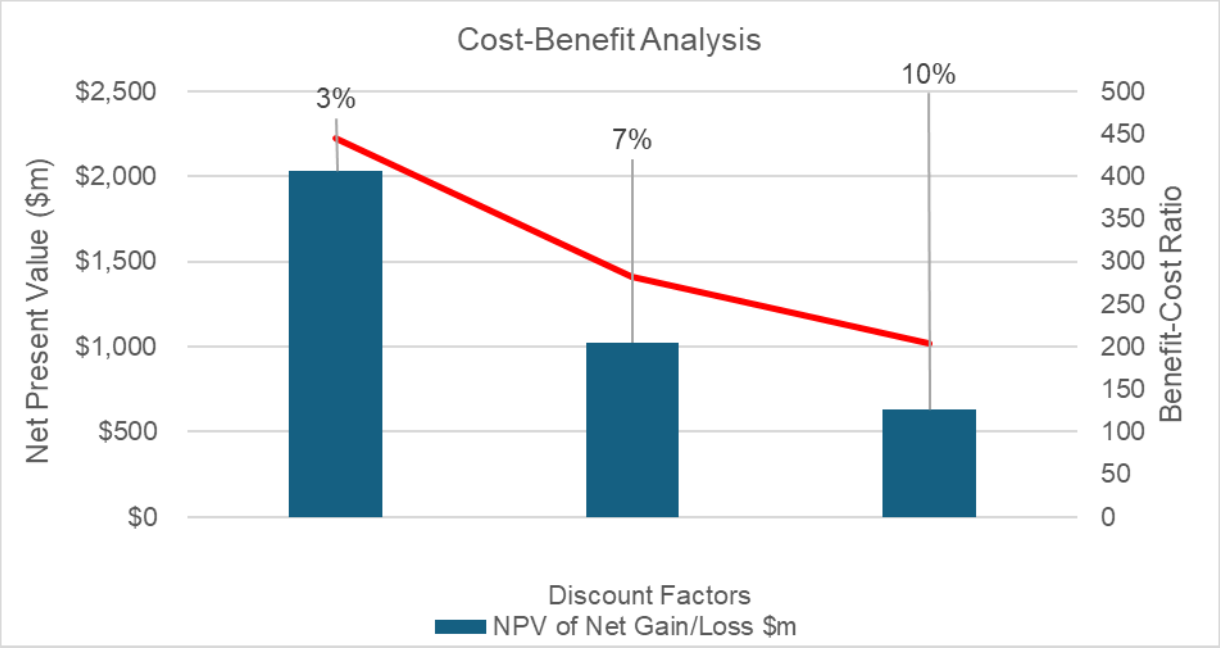


Figure 5: Cost Benefit Summary

Participation Factors

A sensitivity analysis was undertaken to determine the participation factors for key inputs to the risk cost models (i.e. to identify which inputs are most sensitive to overall risk cost).

The participation factor is defined as the ratio of percentage change in output (i.e. risk cost) to a percentage change in input (e.g. VCR). The participation factors for key model inputs are shown in the table below.

Due to the non-linear nature of the risk cost model, the participation factor can change depending on the magnitude of input percentage change.

The model is most sensitive to:

- **changes in the Value of Customer Reliability (VCR) or Restoration time** in the event of a network outage (halving the $/MWh or return to service time) represents decrease in risk cost of approximately $2.04 million, or approximately 46.5% of the original base case risk. This is due the tower representing a single point of failure for both Ross to Dan Gleeson feeders.

Input	Baseline value	Sensitivity value (-50%)	Change in risk cost at 2030 ($m)	Participation (%)
Safety				
Tower Collapse				
Local Road - Likelihood of Safety Incident	2.000%	1.000%	-$0.01	-0.25%
Main Road - Likelihood of Safety Incident	3.000%	1.500%	$0.00	-0.05%
HV Distribution Lines - Likelihood of Safety Incident	2.000%	1.000%	-$0.01	-0.29%
Houses in Fall zone - Likelihood of Safety Incident	10.000%	5.000%	-$0.05	-1.25%
Cost consequence of multiple fatality	$11,400,000	$5,700,000	-$0.01	-0.29%
Cost consequence of single fatality	$5,700,000	$2,850,000	-$0.02	-0.44%
Cost consequence of multiple serious injury	$4,206,600	$2,103,300	-$0.03	-0.65%
Cost consequence of single serious injury	$2,103,300	$1,051,650	-$0.02	-0.54%
Financial				
Tower Collapse				
Emergency premium	20%	10%	$0.00	-0.035%
Unit Cost (Tension)	$451,245	$225,622	-$0.01	-0.206%
Unit Cost (Suspension)	$428,683	$214,341	$0.00	-0.004%
Local Road - Financial Cost of 3rd Party Damage	$900,000	$450,000	-$0.01	-0.302%
Main Road - Financial Cost of 3rd Party Damage	$1,500,000	$750,000	$0.00	-0.064%
HV Distribution Lines - Financial Cost of 3rd Party Damage	$60,000	$30,000	$0.00	-0.023%
Houses in Fall Zone - Financial Cost of 3rd Party Damage	$300,000	$150,000	$0.00	-0.100%
Network				
Tower Collapse				
VCR ($/MWh)	$26,828.00	$13,414.00	-$2.04	-46.516%
Restoration Time (hours)	72	36	-$2.04	-46.516%

Table 3: Participation Factors