January 2026

Powerlink 2027-32 Revenue Proposal

Project Pack

CP.02818 Woolooga to South Pine 275kV Line Refit

Project Status: Unapproved

Network Requirement

The Woolooga to South Pine 275kV transmission line was commissioned in 1972 as part of the Gladstone Power Station development that interconnected the Central and Southern Queensland electricity grids for the first time. The line extends approximately 160km from the northern outskirts of Brisbane to north of Gympie. It is a single circuit 275 steel tower transmission line comprising 358 steel lattice structures. operating mostly in relatively benign corrosion environments though some sections experience higher corrosion due to exposure to salt laden winds at elevation or through proximity to industrial pollution.

The feeder runs through varied atmospheric corrosion environments and is subject to micro-climates associated with the landscape. Most areas are classified as C2 / C3, but sections near Maleny/Montville in the Sunshine Coast hinterland are C4 and subject to increased corrosivity due to high rainfall and exposure to salt laden winds due to elevation. Sections near South Pine Substation experience higher corrosion at C4 levels due to their proximity to Moreton Bay, industrial pollution, and traffic emissions. As a result, many galvanised tower bolts and members in the more corrosive areas are exhibiting evidence of Grade 2 corrosion with a growing proportion classed as corrosion Grade 3 and a significant quantity of Grade 4 bolts.

Overhead earth wire and hardware corrosion has also been observed at Grade 3 and Grade 4 levels in the corrosive environments out of South Pine Substation and the Sunshine Coast Hinterland. Earth wire fault capacity has been assessed and is also a driver for replacement at the South Pine Substation end of the feeder.

Most suspension and bridging insulators have been replaced however the associated hardware was not addressed when new discs were installed and is now exhibiting Grade 3 and Grade 4 corrosion. A large population of tension insulators are original to the line and Grade 3 corrosion has been reported on hot end stems and associated hardware [1].

The Woolooga to South Pine transmission line is a key component to support power transfers between Central and Southern Queensland (CQ-SQ). If this transmission line were to be removed from service at the end of its technical life it would reduce CQ-SQ power transfer capability from around 2,100 MW to around 1,500 MW, a nearly 30% reduction.

A lower CQ-SQ transfer capability will change the mix and location of generation expansion in the National Electricity Market (NEM) compared to if the existing transfer capability is maintained. Powerlink has undertaken market modelling to quantify the gross market benefits of retaining the Woolooga to South Pine transmission line in service. This involved simulating and comparing states of the world with the line maintained in service against a permanent removal of the line across a number of scenarios or sensitivities.

Analysis of plausible future scenarios shows gross market benefits of maintaining the Woolooga to South Pine transmission line in service range from $292 million - $382 million over the period to 2050 [2].

Consistent with the findings and recommendations of Powerlink's Asset Reinvestment Review 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.

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.

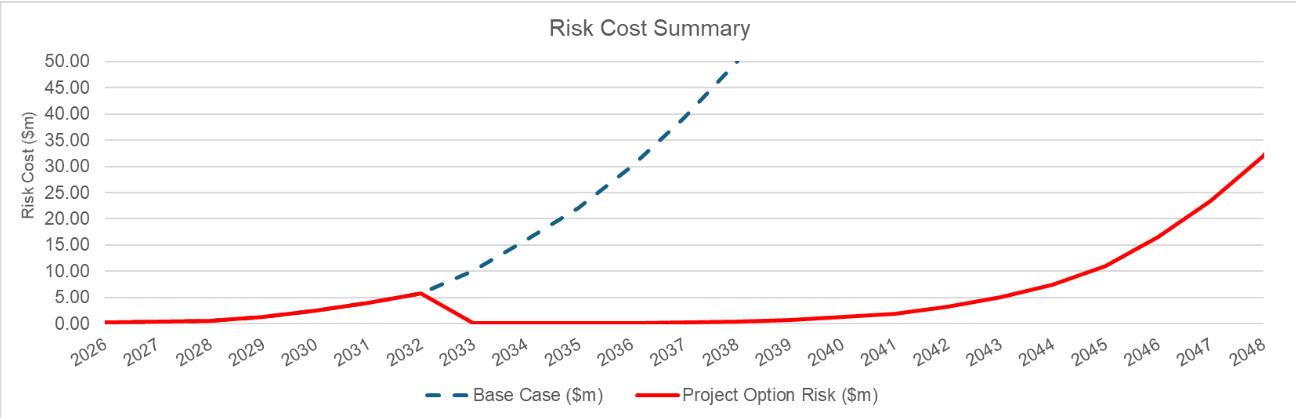
The current recommended option is to undertake staged refit works on selected structures to extend the service life of the Woolooga to South Pine 275kV transmission line for a further 15 years. The three stages of refit works are targeted for June 2032, June 2037 and June 2042 respectively [3].

Options considered but not proposed include:

- Single stage refit of selected structures on the Woolooga to South Pine line – expected to be greater overall cost and with no additional market benefits.

Figure 1 shows the current recommended option reduces the forecast risk monetisation profile of the Woolooga to South Pine transmission line from around $5.8 million per annum in 2032 to less than $0.15 million from 2033 [5]. This benefit of reduction in risk cost is in addition to the benefits available from a lower market development cost when the Woolooga to South Pine transmission line is retained in service.

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



Cost and Timing

The estimated cost of the first stage of refit works on the Woolooga to South Pine 275kV transmission line is $49.7 million ($2025/26) [4].

Target Commissioning Date: June 2032 (first stage).

Documents in CP.02818 Project Pack

Public Documents

1. BS1020 Woolooga to South Pine Transmission Line Condition Assessment Report
2. CP.02818 Woolooga to South Pine 275kV Line Refit – Planning Statement
3. CP.02818 Woolooga to South Pine 275kV Line Refit – Project Scope Report
4. CP.02818 Woolooga to South Pine 275kV Line Refit – Concept Estimate
5. CP.02818 Woolooga to South Pine 275kV Line Refit – Risk Cost Summary Report

Transmission Line Condition Assessment Report - 2025

Built Section 1020

South Pine - Woolooga

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Record ID	A5795070		
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Authorisation Date:	**26/03/2025**		
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Endorsed by:	Manager Asset Strategies	[redacted]	

Compliance

The provision of condition assessment reporting involves complex and scientific calculations and there interpretation, and therefore is a Professional Engineering Service, and as such, must be undertaken in accordance with the Professional Engineers Act 2002, including approval by a Registered Professional Engineer Queensland (RPEQ).

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Version history

Version	Date	Section(s)	Summary of amendment	Author	Approver
1.0	26/03/2025	All	Original Document	[redacted]	[redacted]

Ensure that this document has been endorsed before requesting to submit final versions for approval.

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 a summary of the built section condition 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.

Table of Contents

1. Executive Summary

Built Section 1020 is a single circuit 275kV feeder, identified as Feeder 807, which connects Powerlink's South Pine substation in North Brisbane to the Woolooga substation located north of Gympie. BS1020 comprises 358 steel lattice structures, including 97 tension towers and 261 suspension towers, and was commissioned in 1972 under contract number 11/21.

The feeder runs through varied atmospheric corrosion environments and is subject to micro-climates associated with the landscape. Most areas are classified as C2 / C3, but sections near Maleny/Montville are C4 and subject to increased corrosivity due to high rainfall and exposure to salt laden winds due to elevation. Sections near South Pine Substation experience higher corrosion at C4 levels due to their proximity to Moreton Bay, industrial pollution, and traffic emissions. As a result, many galvanised tower bolts and members in the more corrosive areas are exhibiting evidence of Grade 2 corrosion with a growing proportion classed as corrosion Grade 3 and a significant quantity of Grade 4 bolts.

Overhead Earthwire and hardware corrosion has also been observed at Grade 3 and Grade 4 levels in the corrosive environments out of South Pine Substation and the Sunshine Coast Hinterland. Earth wire fault capacity has been assessed and is also a driver for replacement at the South Pine Substation end of the feeder.

Most suspension and bridging insulators have been replaced however the associated hardware was not addressed when new discs were installed and is now exhibiting Grade 3 and Grade 4 corrosion. A large population of tension insulators are original to the line and Grade 3 corrosion has been reported on hot end stems and associated hardware.

At the time of this condition assessment there are significant open Grade 3 and Grade 4 notifications under 'monitor and review' status. Based upon the data presented in this report and health indices for sample of structures, this line will require reinvestment in the short term.

Predicted end of service life summary table (HI 8)								
Cond	EW	EW Hardware	OPGW	Foundations	Structures (HI 8)	Suspension Strings	Tension Strings	Bridging Strings
2042	2043[1]	2031[1]	-	2066	2028	2031[2]	2031[2]	2047[2]

[1] Earthwire and associated hardware has localised degradation and fault capacity limitations at the South Pine end of the feeder that requires intervention in the short term to maintain serviceable condition.

[2] Original insulators and hardware showing G3/G4 requires intervention in the short term.

1.1 Recommendations

If there are no capacity limitations and there is an enduring need for this feeder, the following refurbishment is recommended as a minimum to extend the life of this built section. Rebuilding the line should be considered as an option subject to economic analysis.

- Replace tower members and fasteners with G3 corrosion and above.
- Replace OHEW and hardware exhibiting G3 corrosion and above and review OHEW fault capacity in the vicinity of South Pine substation.
- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion and above.
- Review tower earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications.
- Review options for resolution of the live climbing restriction on S2S2 and S2S0 towers and implement if cost effective. Should live tower climbing be feasible, the scope of work shall include replacement of all step bolts on all towers to comply with current Powerlink standards. Alternately, if no solution can be found, only replace corrosion grade 3 and 4 step step-bolts.
- Return OHEW sample and conductor bridging samples back to Line Strategies for further analysis.

2. Purpose

This report outlines the assessed condition of Built Section 1020, 275kV Feeder 807, which runs between South Pine Substation and Woolooga Substation. The report has been produced to assist in determining an asset management strategy for the line.

3. Scope

The report examines the condition of the transmission line's major component groups, using field data and maintenance records based upon Powerlink asset management guidelines.

The Levels of Corrosion assigned to components are based on the corrosion/deterioration classifications used in Powerlink's Visual Inspection Guides and summarised below.

Level of Corrosion	Description
Grade 2 (G2)	Corrosion observed which should continue to be **Monitored and Reviewed.**
Grade 3 (G3)	Corrosion which represents a loss of greater than 50% of the galvanising layer and in the worst cases unprotected carbon steel corrosion is about to commence.
Grade 4 (G4)	Corrosion which represents the total loss of galvanising and the onset of unprotected carbon steel corrosion.

4. Transmission Line Parameters

4.1 Overview

Built Section 1020 is 159.92km long and consists of 358 steel lattice structures: 97 tension and 261 suspension. It is a single circuit 275kV feeder (F807) running from South Pine Substation to Woolooga Substation north of Gympie.

There are live climbing restrictions on S2S2 and S2S0 delta towers installed on this built section. Refer HSE Alert ID 2024.01. Due to a restricted climbing corridor, many maintenance activities including inspection can be more complicated and costly on these structures. Typical structures are shown in Figure 2 and Figure 3.

As a result of the orientation of the feeder, the distance from the coast varies significantly between the northern and southern ends of the feeder. Coastal winds and salt affect elevated structures in the Sunshine Coast hinterland and the southern end of the built section are particularly affected. Microenvironments may also be situated throughout these lines as they pass through humid forestry with varying elevation.

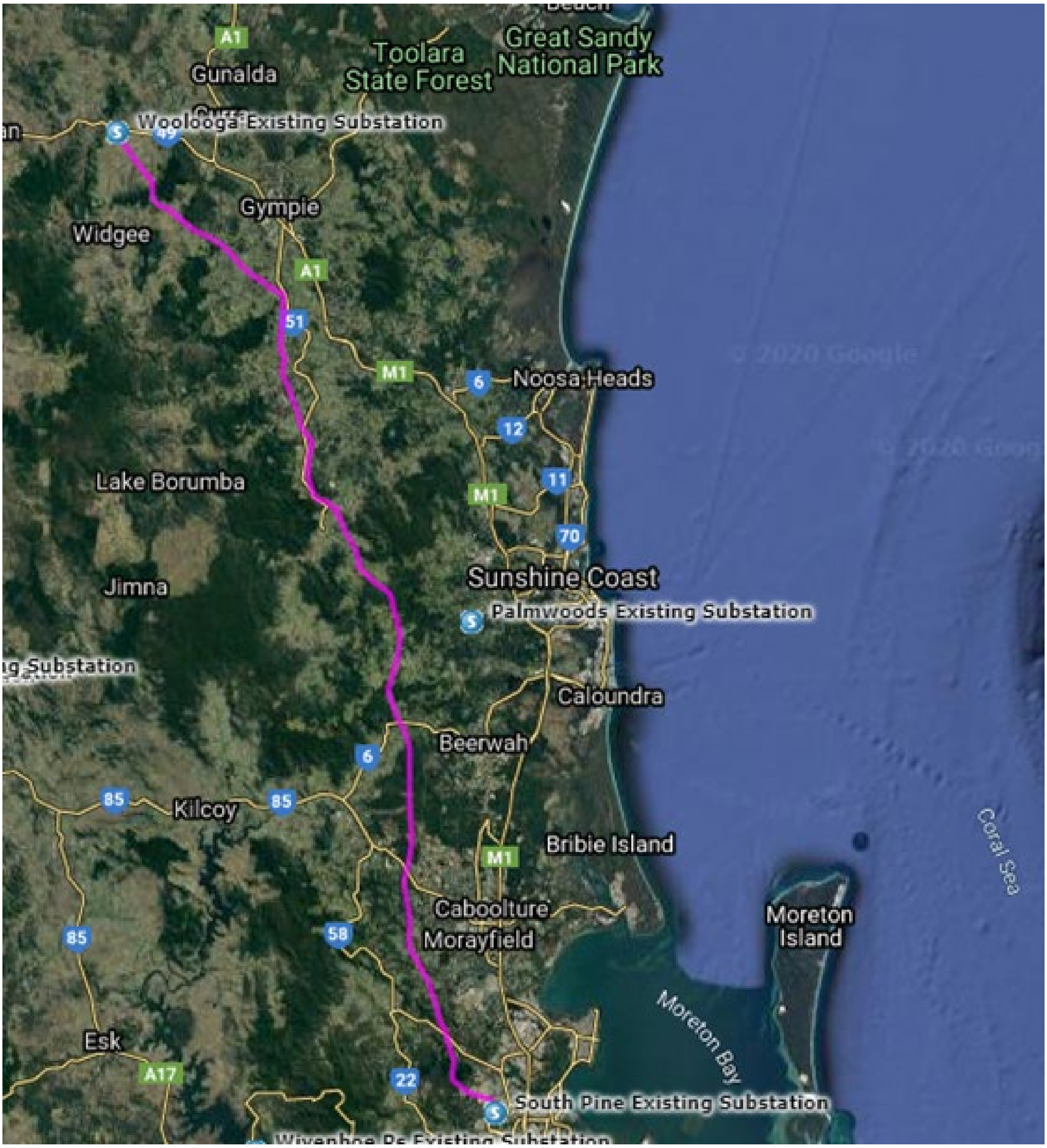


Figure 1 - Geographical Overview of BS1020

Figure 2 - 1020-STR-4025 - Tension Tower

Figure 3 - 1020-STR-4042 - Suspension Tower

4.2 Asset Summary Table

Built Section	1020
Commissioning Date	13.11.1972
Voltage	275kV
Contract Number	11/21
No. of Circuits	1
Circuits	F807
Route Length (km)	159.92km
No. of Towers	97 Tension 261 Suspension
Type	Galvanised Steel Lattice Tower
Foundations	Bored Straight Side / Bored Undercut / Mass Concrete
Conductor	ACSR/GZ 30/7/3.71 (GOAT)
Sub-Conductor /Phase	2
Conductor Line Clamps	AGSU and compression tubes
Conductor Vibration Dampers	4D-30/27

No. of OHEW	2
Earthwire	SC/GZ/I_19/2.03
OHEW Line Clamps	Twin Grips and gimbal
OHEW Vibration Dampers	Spiral
No. of OPGW	0
AVG Easement width	70m

4.2.1 Insulators

FUNCTION	STRINGS	MATERIAL	RATING	TYPE	DISCS	INSTALLED
SUSPENSION	42	PORCELAIN	125	FOG DISC	17	2005
	102	PORCELAIN	125	FOG DISC	17	2008
	30	PORCELAIN	125	FOG DISC	17	2010
	344	PORCELAIN	125	FOG DISC	17	2012
BRIDGING	6	PORCELAIN	125	FOG DISC	17	1976
	5	PORCELAIN	125	FOG DISC	18	2006
	7	PORCELAIN	125	FOG DISC	18	2012
	27	PORCELAIN	125	FOG DISC	17	2014
	34	PORCELAIN	125	FOG DISC	17	2015
TENSION	26	PORCELAIN	125	FOG DISC	18	2012
	168	PORCELAIN	125	FOG DISC	18	2014
	12	PORCELAIN	125	FOG DISC	18	1972
	958	PORCELAIN	125	NORMAL DISC	18	1972
V-STRING	42	PORCELAIN	125	FOG DISC	19	2005
	102	PORCELAIN	125	FOG DISC	19	2008
	30	PORCELAIN	125	FOG DISC	19	2010
	348	PORCELAIN	125	FOG DISC	19	2012
RESTRAINT BRIDGING	2	PORCELAIN	125	NORMAL DISC	17	1972
	24	PORCELAIN	125	FOG DISC	18	2006
	38	PORCELAIN	125	FOG DISC	18	2012
	2	PORCELAIN	125	FOG DISC	19	2012
	37	PORCELAIN	125	FOG DISC	18	2014
	37	PORCELAIN	125	FOG DISC	19	2014
	36	PORCELAIN	125	FOG DISC	18	2015
	38	PORCELAIN	125	FOG DISC	19	2015
BALANCED STRAIN	16	SILICONE	160	COMP.LONGROD	87	2013

Table 1 - BS1020 Insulator data from BOM

Note: red denotes original 1972 insulation.

5. Location and Environment

5.1 General Location

The transmission line starts in Brendale, north of Brisbane and extends to Woolooga, north of Gympie. The built section covers the full distance between South Pine and Woolooga substations. Parts of this transmission line traverse residential areas and there are multiple road crossings, both major motorways and minor roads.

Figure 5 - Residences close to BS1020

Figure 4 - D'Aguilar Highway 1020-SPN-092G

5.2 Atmospheric Corrosion

Built Section 1020 is located approximately 9km from the coast at the nearest point, South Pine Substation and up to 67km from the coast at Woolooga Substation at the northern end of the line. This built section experiences an average rainfall of around 1134mm with a mean annual humidity of approximately 61%.

The atmospheric corrosion environment through which the line runs is substantially C3 according to Australian Standards which is a mild corrosive environment with low exposure to industry. A significant section of the line near Maleny/Montville is elevated and has some exposure to salt laden winds which has resulted in this section being classified as corrosion region C4 (a moderate corrosion environment typical in areas of increased vegetation within and adjacent to the easement). A small section near South Pine substation has been classified as C4 due to industrial and traffic pollution, as well as its proximity to Moreton Bay.

The highest rates of atmospheric 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 fairly constant for a given geographical area, although some localised variation due to structure orientation is possible.

This increased potential for corrosion based upon microclimatic conditions and coating thickness is, as a general rule, 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.

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

Component	**Minimum coating thickness µm**	**Estimated life to First Service in Years** *(First Appearance of Grade 2)*			
		C2	**C3**	**C4**	C5
Bolts & nuts	45	64	**22**	**11**	5
Members ≤ 6mm	70	100	**33**	**17**	8
Members > 6mm	85	121	**40**	**20**	10

The final stages of G3 Corrosion represent 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. Condition Assessment

6.1 Summary of BS 1020 Health Indices

The condition data detailed in the sections below has been summarised in Figure 6 which is a graph of available health indices for the major components of BS1020.

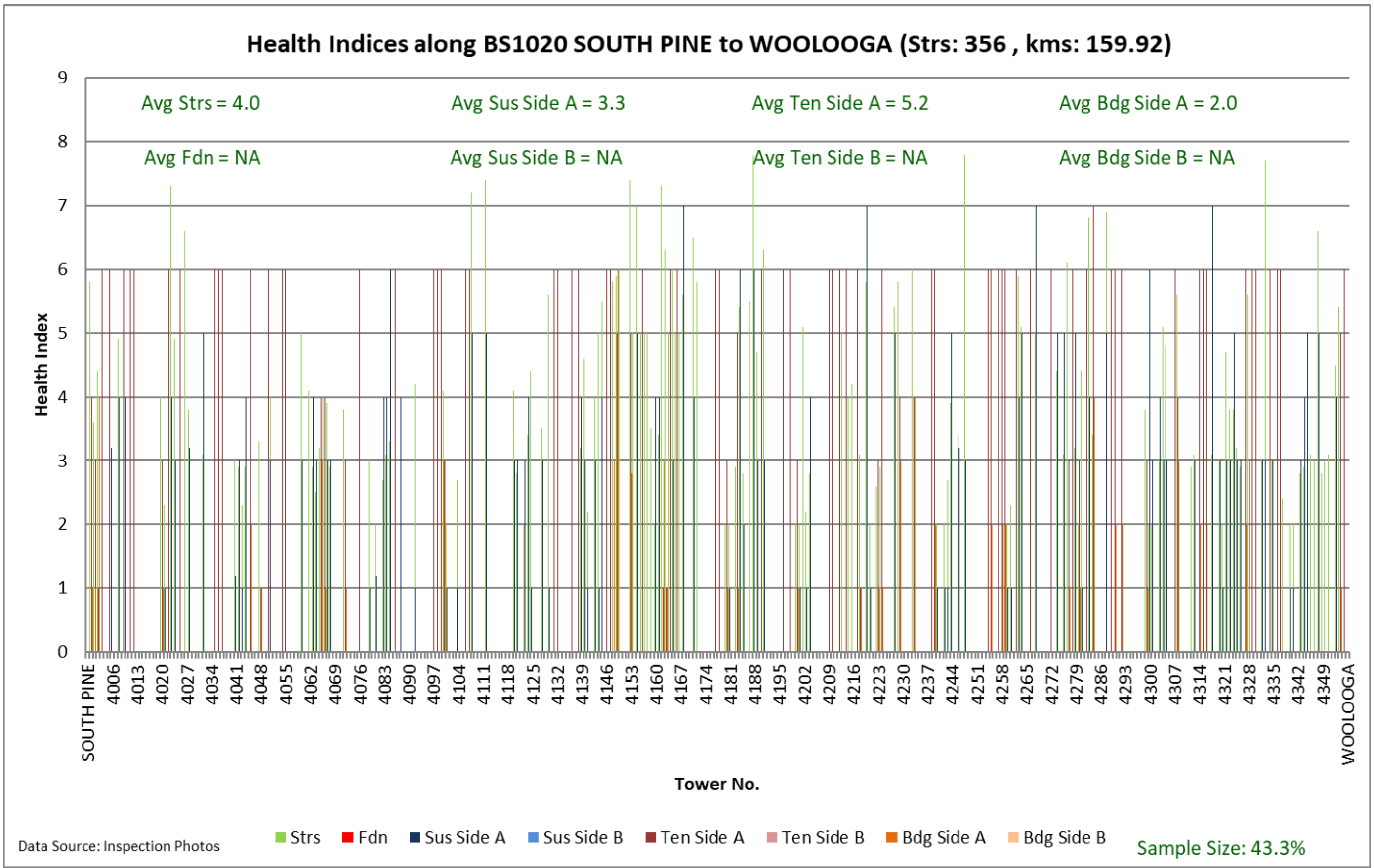


Figure 6 - Graph of BS1020 Health Indices

Corrosion related defect notifications have been visualised in Appendix 7.1. These graphs highlight the microclimates found along this built section with higher levels of Grade 3 and Grade 4 corrosion found in the Sunshine Coast hinterland and towards the southern, South Pine substation end of the line. There is some correlation between the notification graphs and the health index graph above, which shows slightly higher percentages of corrosion (and higher health indices) in the same areas.

The following work order costs presented in Figure 7 show that on average, $841,592 p.a. is spent on maintenance across 358 structures, equating to $2,352 per structure, per year.

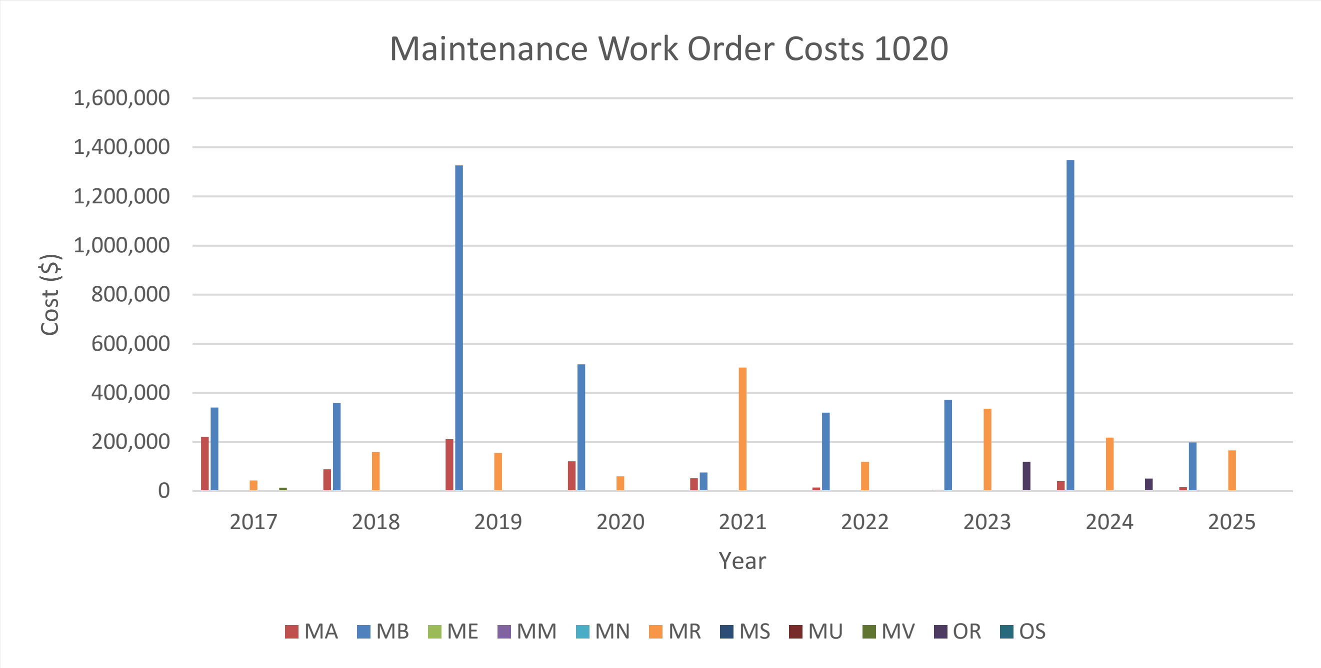


Figure 7 - Maintenance Work Order Costs 1020

6.2 Structure Condition

The table below summarises the average condition of structure zones. Based on direct visual and photographic assessment, the estimated remaining service life has also been provided for the built section.

It is noted that this assumes 5% exceedance across the line, i.e. 95% of structures will have a lower health Index while 5% will exceed this value. Using this method, it is estimated that a Built Section Health Index of 7 has already been exceeded, and a Health Index of 8 will be reached by 2028. Refer Figure 8.

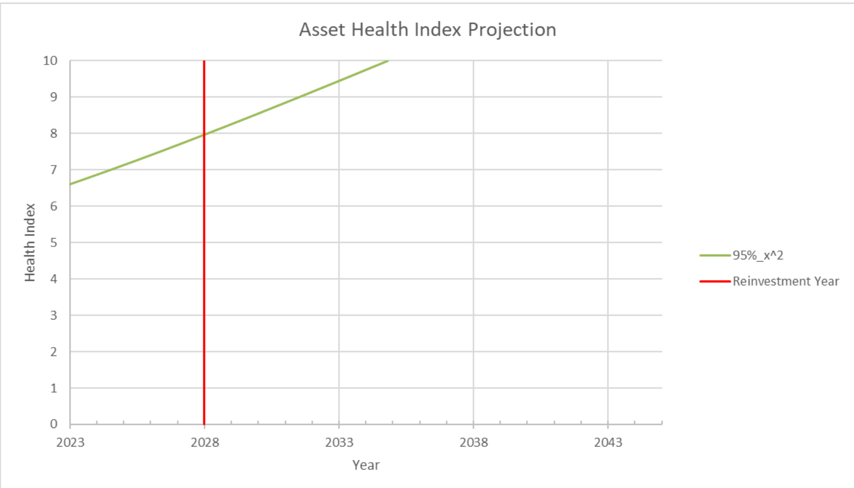


Figure 8 - Asset Health Index Projection

The percentage of heath indices which exceed 95% equates to approximately 35 structures.

Average Observed Corrosion Grades are based upon Powerlink Visual Inspection Guides, as applied by field crews or to photographic evidence. It is noted that for BS1020, variation in corrosion levels between different geographic sections of the line is very significant and is not always evident in average levels by structure zone. The measurement document data is contained in and extracted from SAP.

Table 1 below summarises the average condition of each zone on structures. Based on visual assessment and Powerlink systems to predict deterioration, the estimated remaining service life has also been provided for structures.

Average Observed Corrosion Grades are based upon Powerlink Visual Inspection Guides, as applied by field crews or to photographic evidence from 2021 to 2025.

Structure Zone		Average Level of Corrosion (%)				Sample Size	Installed Year	Health Index (95%)	Estimated Years
		Structure							
Foundations		G1	G2	G3	G4		1972	2.7	36 to 36
	Legs	99.9	0.1	0	0	43			
Structure Overall		G1	G2	G3	G4	71	1972	7.1	3 to 3
	Fasteners	84.5	13.4	1.67	0.41	71			
	Members	98.3	1.6	0.09	0.05	71			
Climbing Aids		G1	G2	G3	G4				
	Fasteners	91.6	8	0	0	71			
Tower Base		G1	G2	G3	G4				
	Fasteners	86.41	12	1.17	0.42	71			
	Members	98.72	1.2	0.07	0.01	71			
Tower Body		G1	G2	G3	G4				
	Fasteners	91.49	7.5	0.93	0.08	71			
	Members	98.43	1.4	0.1	0.07	71			
Superstructure		G1	G2	G3	G4				
	Fasteners	80.92	16.4	2.23	0.45	71			
	Members	98.23	1.6	0.1	0.07	71			
Cross Arms		G1	G2	G3	G4				
	Fasteners	80.6	16.6	1.8	1	71			
	Members	96.96	2.9	0.14	0	71			
Conductor Attachment Plate		G1	G2	G3	G4				
	Fasteners	79.72	15.5	2.81	1.97	70			
EW Peak		G1	G2	G3	G4	71			
	Fasteners	89.88	9.6	0.38	0.14	50			
	Members	98.4	1.6	0	0	50			
		Min	Max	Avg					
Structure Earthing Resistance		0.88	71.7	8.7		323			

Table 2 - Average condition of each zone on structures

Based on the data presented in Table 3 the following commentary has been provided. The commentary relates to items of interest from the table and typically only represents the worst sections of the line. These notes highlight the key condition drivers that could be used to develop a project scope.

Structure Zone	Comment
Foundation	Structures utilise a standard steel reinforced concrete foundation. Overall, the foundations are in good condition with only 0.1% showing signs of Grade 2 corrosion.
Climbing Aids	Step bolts appear in good condition with 8% Grade 2 corrosion observed although recent photos indicate that Grade 3 corrosion may be present. Refer Figure 11. It is noted that step bolts do not meet current standards for climbing aids, which incorporate a climbing attachment point.
Tower Base	Members are in good condition with low levels of Grade 2, but < 1% of Grade 3 and 4, which is expected for structures of this age. The nuts and bolts of this structure zone are experiencing Grade 2 corrosion at 12% of sampled structures, Grade 3 at 1.17% and < 1% at Grade 4. Geographic variation is noted with increased corrosion observed in the Maleny/Montville section.
Tower Body	Most of the tower body bolts are still in Grade 1 condition with 7.5% Grade 2, but 1.1% in Grade 3 and Grade 4 corrosion levels. Members are predominately Grade 1 with Grade 2 corrosion exhibited on 1.4% of sampled structures and < 1% of Grade 3 and 4, which is expected for structures of this age. Geographic variation is noted with increased corrosion in the Maleny/Montville section, and at the southern end of the feeder.
Superstructure	Members are in reasonable condition 1.6% Grade 2 and < 1% Grade 3 and 4 corrosion. 2.23% of nuts and bolts are corrosion Grade 3 and < 1% Grade 4. Geographic variation is noted with increased corrosion in the Maleny/Montville section, and at the southern end of the feeder.
Cross Arms	Members are showing levels of Grade 2 corrosion over 2.9% and < 1% Grade 3 of sampled members. Nuts and bolts are showing 1.8% Grade 3 and 1% Grade 4 corrosion. Geographic variation is noted with increased corrosion in the Maleny/Montville section, and at the southern end of the feeder.
Cond. Attachment	Attachment plates are in good condition with only 2.8% Grade 3 corrosion and 2.0% Grade 4 on nuts and bolts. Geographic variation noted with increased corrosion in the Maleny/Montville section, and at the southern end of the feeder.
Earthwire Peak	Grade 3 and 4 corrosion at < 1% on nuts and bolts. Geographic variation is noted with increased corrosion in the Maleny/Montville section, and at the southern end of the feeder.
Anti-climbing Barrier	These towers have the standard barb wire installed, no issues found in condition.

Figure 9 below is a frequency distribution of structure health indices based on the sample of data. The distribution can help determine if projects can have a staged delivery.

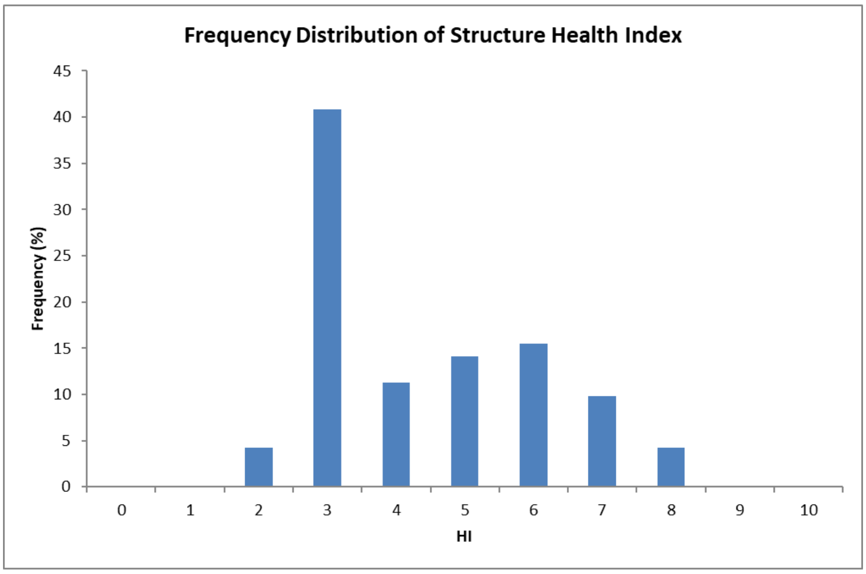


Figure 9 - Frequency Distribution of Structure Health Index

Below are the health indices of structures along the built section. These values are based on the calculated health index data for the sample of structures that were inspected. The calculated values have been extrapolated from the date they were recorded to the current year. The health index values for towers between known (calculated) points have been interpolated to determine an estimate of health index for those structures where no condition data is currently available. The estimated values have not been used for calculating the asset health index, and as estimates only, should not be relied on.

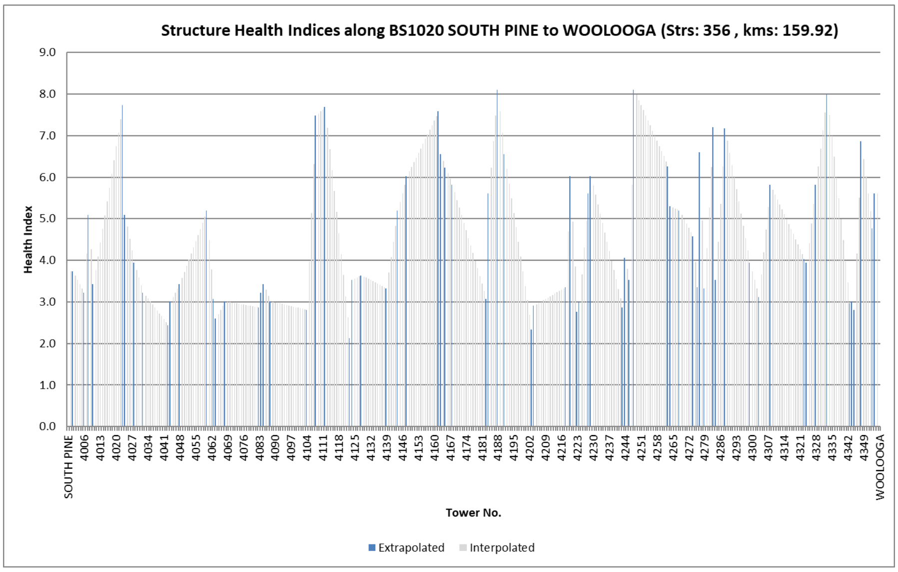


Figure 10 - Health Index Profile

To aid with estimation, the average levels of corrosion are calculated. Below is the projection of the average level of bolt corrosion on the entire built section based on the sample of data and an estimated service life of 57 years for bolts.

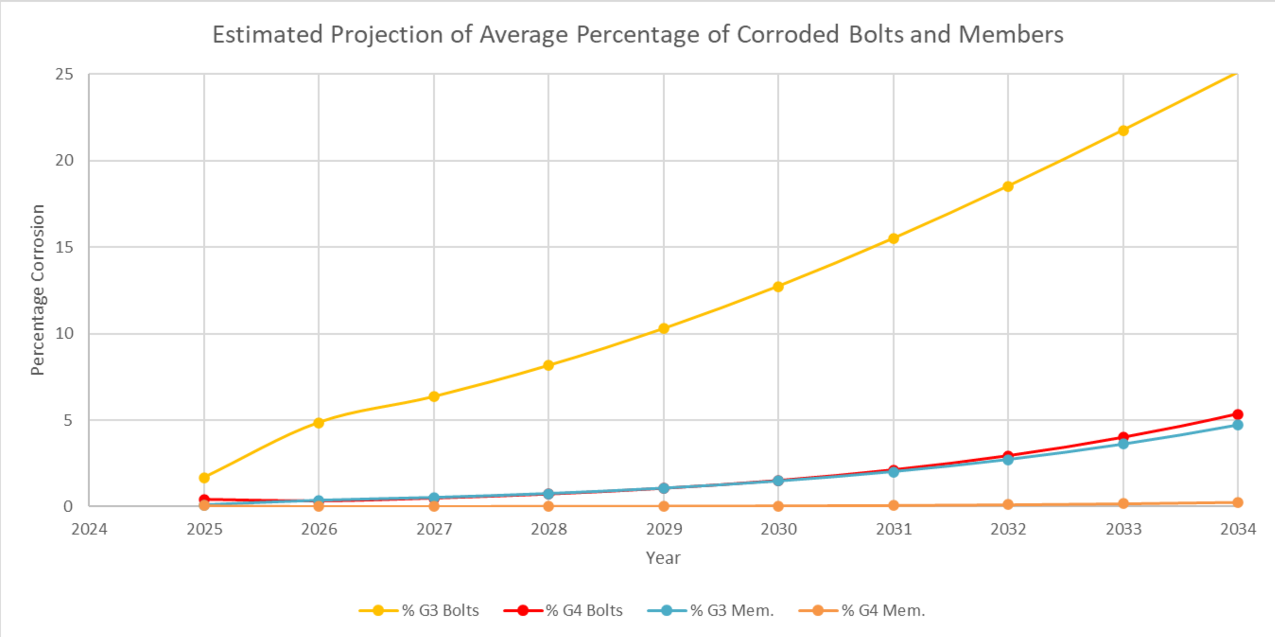


Figure 11 - Estimated Projection of Bolt and Member Corrosion

6.2.1 Foundations

Foundations appear in serviceable condition.

6.2.2 Bolts and Members

Figure 9 and Figure 10 below structure corrosion along the built section based on the sample of data. A strong trend of increased bolt and member corrosion in the Sunshine Coast hinterland can be seen.

There are a significant number of outstanding notifications regarding Grade 3/4 corrosion on the structure body under monitor and review.

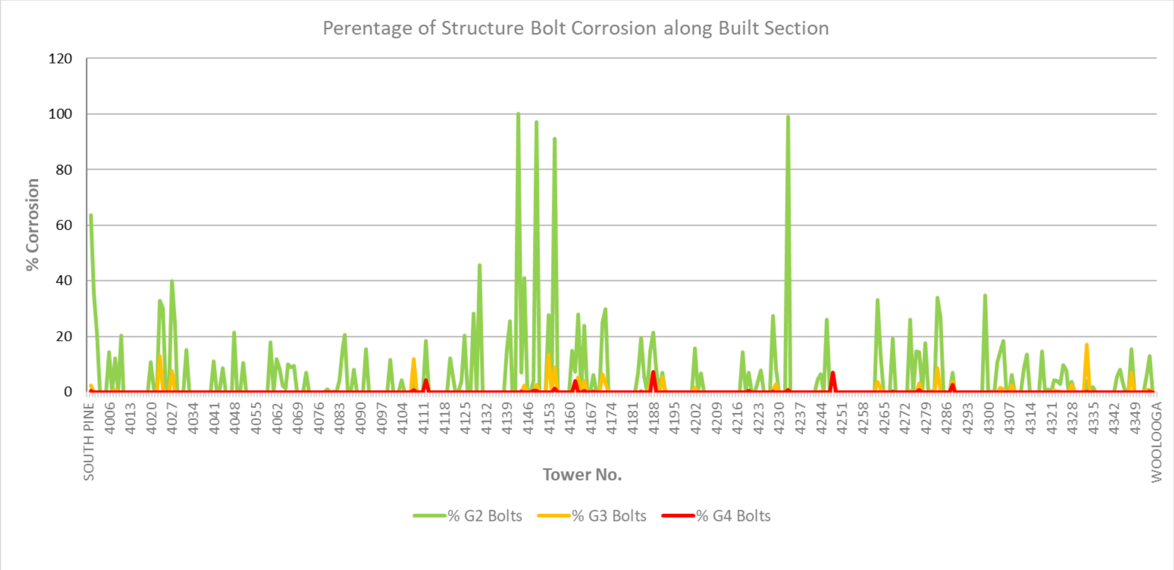


Figure 12 - Percentage of Structure Bolt Corrosion along Built Section

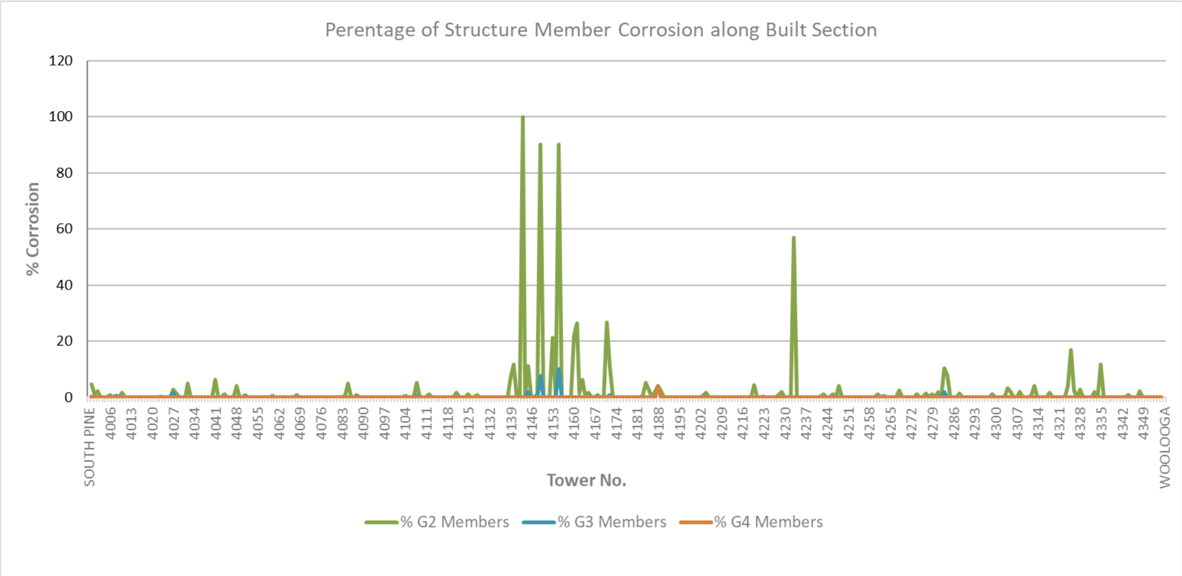
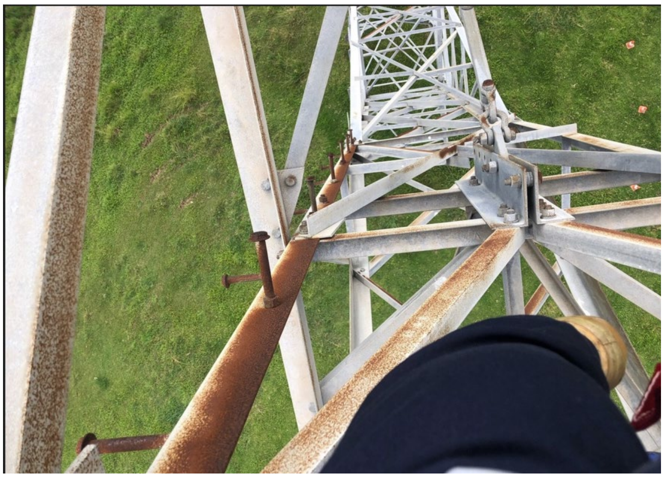


Figure 13 - Percentage of Structure Member Corrosion along Built Section

1020-STR-4000

1020-STR-4278

1020-STR-4161



1020-STR-4161

Figure 14 - Example G3/G4 Bolt and Member Corrosion

6.3 Insulators and Hardware

The table below summarises the average condition of each insulator string based on visual assessment and past experience. The estimated remaining service life has also been provided. Corrosion grades are based upon Powerlink Visual Inspection Guides, as applied by field crews or to photographic evidence.

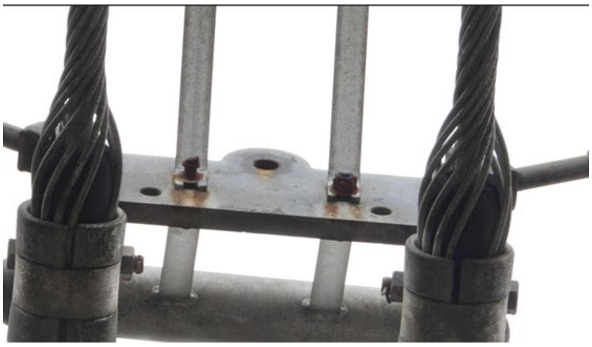
Component	Corrosion Grade / Condition (%)								Sample Size	Installed Year	Health Index (95%)	Estimated Years until HI of 8
Suspension - Side A										1972	6.3	6
Insulators	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	55.8	0	39.5	4.7	0	0	0	0	43	1972		21 to 30
Hardware	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	39.4	0	43.9	13.6	1.5	0	1.5	0	66	1972		3 to 14
Hanger Brackets	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	59.1	0	28.8	4.5	7.6	0	0	0	66	1972		14 to 21
Hanger Bkt Fasteners	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	35.9	0	25	10.9	20.3	3.1	4.7	0	64	1972		3 to 8
Clamp Fasteners	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	60.6	0	34.8	3	0	1.5	0	0	66	1972		8 to 21
Clamps	Ok	Worn Rubber	Aged									
	97	0	3						66			
Insulator Shed	OK	Polluted	Dust	Moss	Fungi	Disc-cracked	Disc-chipped					
	100	0	0	0	0	0	0		66			
Tension - Side A										1972	6.3	6
Insulators	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	47.8	0	39.1	13	0	0	0	0	23	1972		21 to 33
Hardware	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	47.8	0	30.4	21.7	0	0	0	0	23	1972		21 to 33
Deadend	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	73.9	0	21.7	4.3	0	0	0	0	23	1972		21 to 33
Insulator Shed	OK	Polluted	Dust	Moss	Fungi	Disc-cracked	Disc-chipped					
	91.3	0	0	8.7	0	0	0		23			
Bridging - Side A										1972	3.5	27
Insulators	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	81.8	0	18.2	0	0	0	0	0	11	1972		33+
Hardware	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	86.4	0	13.6	0	0	0	0	0	22	1972		33+
Clamp Fasteners	Nil	G1	G2L	G2H	G3L	G3H	G4L	G4H				
	86.4	0	9.1	4.5	0	0	0	0	22	1972		21 to 33
Insulator Shed	OK	Polluted	Dust	Moss	Fungi	Disc-cracked	Disc-chipped					
	95.7	0	0	4.3	0	0	0		23			

Please refer to Table 1 for details of BS1020 insulator ages and types. Due to the very wide range of ages and types of BS1020 insulators there is also significant variation in condition, and some specific issues have been identified.

There are a significant number of outstanding notifications regarding Grade 3 and Grade 4 corrosion on insulator hardware under monitor and review that should be addressed under any associated works.

Insulator String Function	Comment	Estimated Remaining Service Life (years)
Suspension	Suspension insulators have mostly been replaced, with an install date range from 2005 to 2012. As a result, all are in good condition with 4.7% G2H and 39.5% G2L corrosion observed. Suspension insulator hardware, hanger brackets and associated fastener corrosion was not addressed when new discs were installed and are now exhibiting corrosion Grade 3 and Grade 4.	Suspension insulators appear ok. Estimated service life of 6 years on original hardware.
Tension	A small number of tension insulators have been replaced however the majority are original to the line. Grade 3 corrosion has been observed on tension insulators hot end stems and hardware.	Original tension Insulators and hardware have an estimated service life of 6 years.
Bridging	Under OR.01735, most bridging strings were replaced in 2015. Remaining original bridging insulators and hardware are typically Grade 2 and low Grade 3 and will require replacement in the medium term. Photos indicate cold end bridging hardware at high Grade 3 levels.	Bridging insulators and hardware original to the line have an estimated service life 20 years.

1020-STR-4002



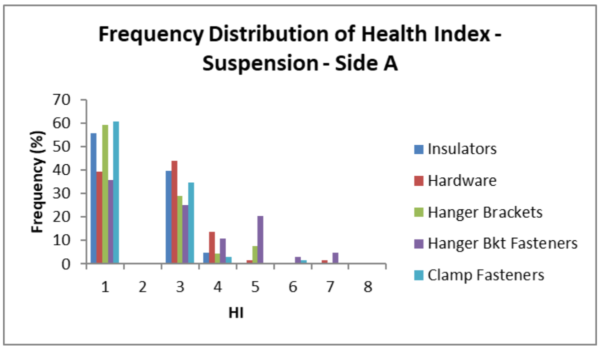
1020-STR-4171

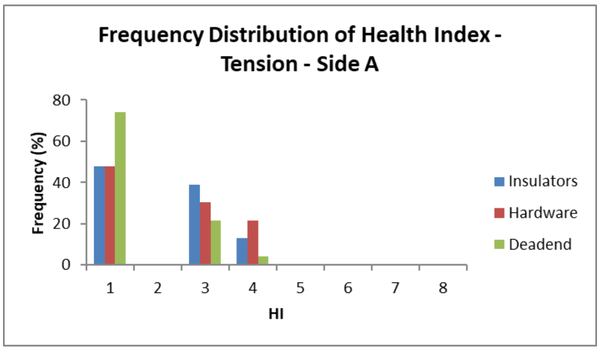
1020-STR-4213

1020-STR-4303

Figure 15 – Indicative Insulator Hardware Corrosion

Below is the frequency distribution of suspension and tension insulator health index based on the sample of data.





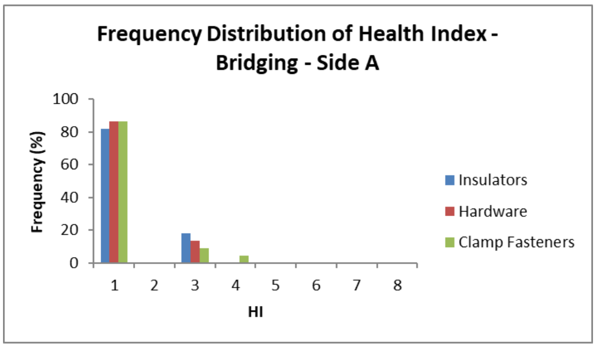


Figure 16 - Health Index Frequency Distribution - Insulators

6.4 Conductor and Conductor Hardware

BS1020 is strung with twin ACSR/GZ GOAT 30/7/3.71 that is original to the line. Condition appears commensurate with age with no known condition drivers for replacement. Conductor dampers appear to be in serviceable condition.

Component	Installation Year	Comment	Estimated Remaining Service Life (years)
Conductor	1972	Twin ACSR/GZ GOAT 30/7/3.71	17
Conductor Dampers	1998-2002	4D-30/27	Replace on condition or with conductor

6.5 Earthwire and Hardware

The two overhead earthwires are imperial SC/GZ 19/2.03 and are original from line commissioning. Corrosion Grade 3 and Grade 4 has been observed in the Sunshine Coast Hinterland Region.

Preliminary calculations indicate that fault capacity the Overhead Earthwire at the South Pine Substation end of the feeder is under rated based on 2024 substation fault levels. Advanced corrosion on the earthwire conductor and associated hardware has also been observed in this this section of the line.

Component	Installation Year	Comment	Estimated Remaining Service Life (years)
OHEW	1972	SC/GZ/I_19/2.03	3 - 8
OHEW Dampers	1995-2002	Spiral	Replace on condition or with conductor

1020-STR-4000

1020-STR-4070

Figure 17 - Indicative OHEW Corrosion

6.6 Earthing

Structure earthing classification in SAP is inconsistent with the area classification and requires assessment. Photos indicate that grading rings could be installed, and SAP data is incorrect. Refer Table 4.

Structure earth resistances exceed target maintenance values in some locations. Refer Table 5.

Component	Installation/Repair Date	Corrosion Grade/Comment	Estimated Remaining Service Life (years)
Earthing	1972	Notifications indicate history of broken earth straps. High earth resistance measurements observed in Urban environment towards South Pine Substation	Repair as required on condition

AS7000 Structure Earthing Classification	Grading Ring Installed	Grading Ring Not Installed
Urban	5	10
Aquatic		1
Backyard	1	3
Remote	32	304
In Substation		2
Grand Total	**38**	**320**

Table 3 - AS7000 Classification - Grading Ring Status

1020-STR-4161

Figure 18 - Indicative earthing strap condition

Sap Number	Classification	Ohms	Measurement Date
1020-STR-4012	Urban	34	22/08/2023
1020-STR-4013	Urban	42	22/08/2023
1020-STR-4014	Urban	38	24/08/2023
1020-STR-4015	Urban	72	24/08/2023

Table 4 – Known Locations with Measured Earth Resistances >30 ohms

7. Appendix A

7.1 SAP Notifications Graph BS1020

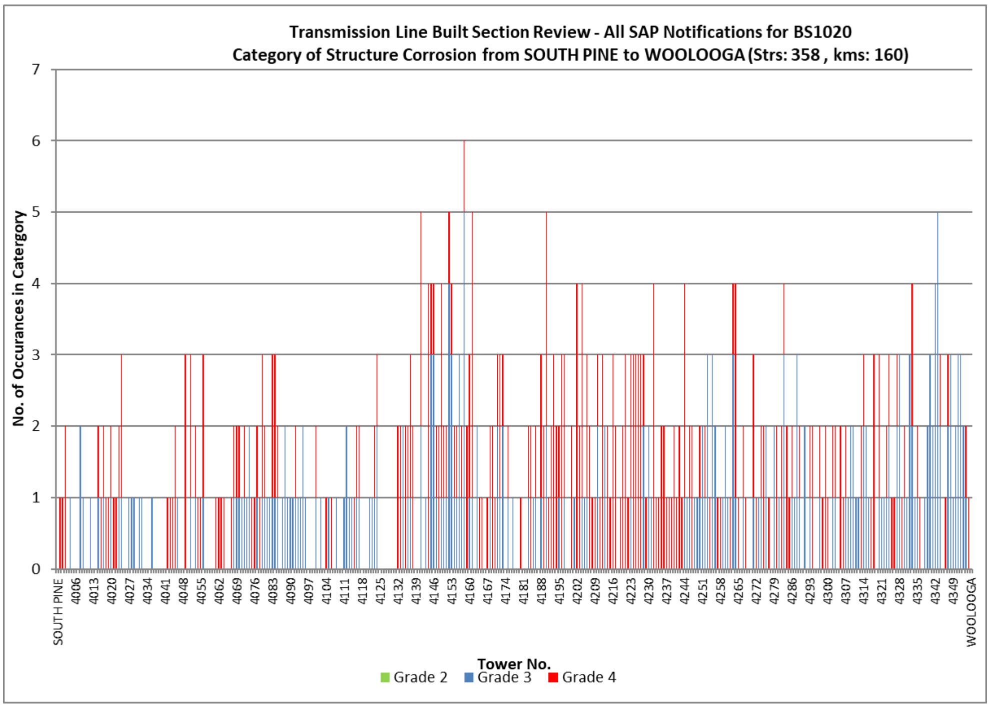


Figure 19: Graph of SAP all Notifications for Corrosion on Structures

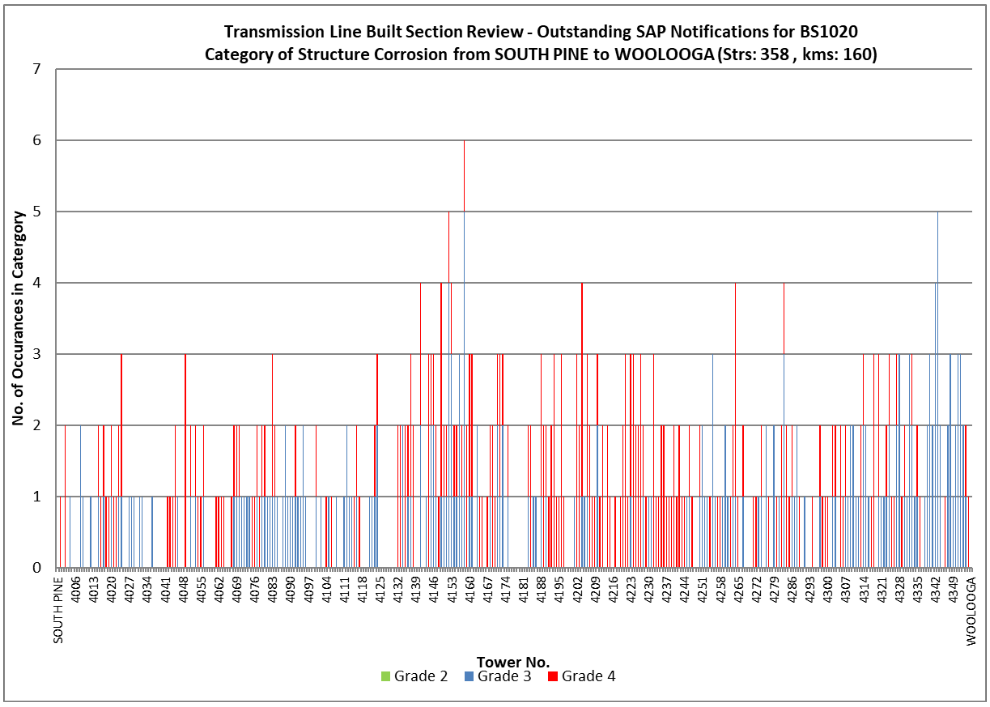
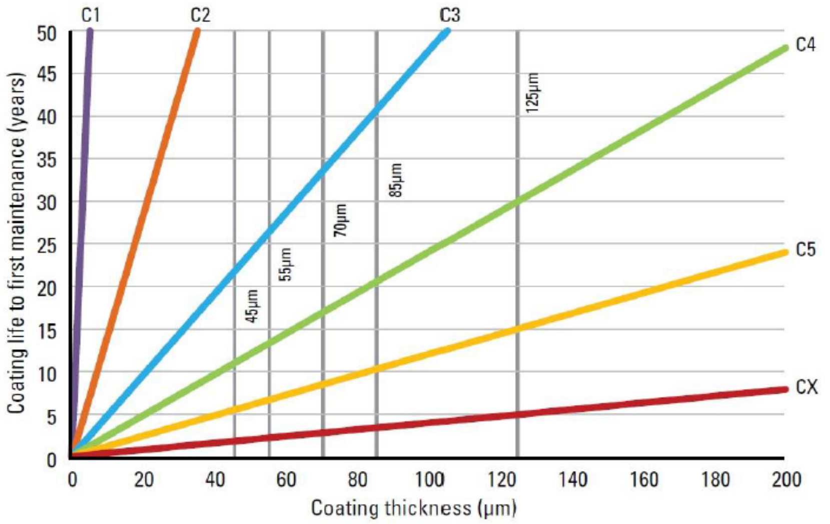


Figure 20: Graph of SAP Outstanding Notifications for Corrosion on Structures

7.2 Estimated Service Life of Galvanised Steel

Corrosivity Category	Corrosivity	Example
C2 (B)	Low	Very mild corrosion environment, such as semi-arid rural environment, with low humidity and rainfall, some rural activity, and/or minor vegetation encroachment into the easement.
C3 (C)	Medium	Mild corrosion environment, such as typical rural areas with moderate humidity and rainfall, average rural activity, and/or moderate vegetation encroachment into the easement.
C4 (D)	High	Moderate corrosion environment, such as in low density urban development or high activity rural areas, inland coastal regions, moderate to high humidity and rainfall, and/or moderate to heavy vegetation encroachment into the easement.
C5 (E)	Very High	Aggressive corrosion environment and/or close proximity to high salt coastal regions. Average Annual Rainfall may vary. Moderate to dense urbanised area with high public exposure will be included in this category.

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.

Figure 21 - Life to First Maintenance of Galvanised Steel – Galvanisers Association of Australia

Region	Max Rate (µm/yr)	Bolts & Nuts (45µm)		Members <= 6mm (70µm)		Members > 6mm (85µm)	
		Min Yrs	Max Yrs	Min Yrs	Max Yrs	Min Yrs	Max Yrs
C2 (B)	0.7	64	450	100	700	121	850
C3 (C)	2.1	21	64	33	100	40	121
C4 (D)	4.2	11	21	17	33	20	40
C5 (E)	8.3	5	11	8	17	10	20

7.3 Estimated Service Life of Carbon Steel

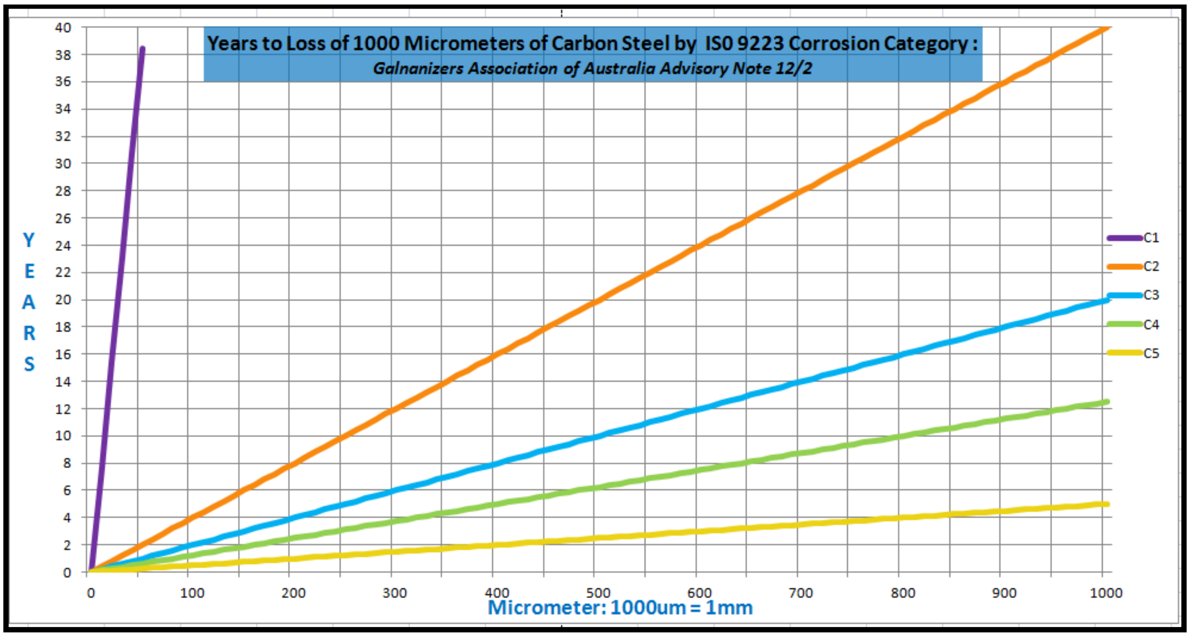


Figure 22 - Rate of Carbon Steel Loss

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

7.4 References

- A2628257 Asset Strategies – Line Maintenance Principles – Specification
- A2791823 OSD – Transmission Line Patrol and Inspection – Guideline
- Galvanizers Association of Australia – Advisory Note GEN12/2 *"Atmospheric Corrosion Resistance of Hot Dipped Galvanized Coatings"* April 2012.
- AS/NZS 2312-2002 – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

7.5 Built Section Configuration

- SAP Reports

7.6 Condition Assessment Data

- M Drive Photos
- Transmission Line Condition Summary Spreadsheet

8. Distribution List

Divisional Distribution	Contact details
Chief Executive	N/A
Delivery and Technical Solutions	N/A
Energy Futures	N/A
Finance and Governance	N/A
Network and Business Development	Manager Asset Strategies
Operations and Service Delivery	Mgr Primary Systems Field Engineering
People and Corporate Services	N/A
Group/Team Distribution	**Contact details**
NBD - Asset Strategies	NBD.ASP.AS.Lines Strategies (Powerlink) Lines Strategies (Objective Group)
External Distribution	**Contact details**
	N/A

Planning Report	**19 November 2025**
Title	CP.02818 - South Pine to Woolooga Line Refit
Zone	CQ-SQ (Coastal)
Need Driver	Network and safety risks arising from the ageing condition of BS1020 (Feeder 807).
Network Limitations and statutory requirements	Failure to address the ageing section 1020 will increase the risk of Powerlink breaching its Transmission Authority Reliability Standard for the Sunshine Coast and Southeast Queensland regions.
Pre-requisites	None

Executive Summary

The Central Queensland to South Queensland (CQ-SQ) 275kV coastal transmission corridor plays a critical role in maintaining power transfer capability across the state and supporting Queensland's energy transition.

The refit of the Woolooga to South Pine 275kV line (807 - Built Section 1020) addresses the asset condition and safety risks and maintains network capability across the CQ-SQ grid section.

Failure of feeder 807 reduces the transfer capability of the CQ-SQ grid section from approximately 2100MW to 1500MW. Until the line can be returned to service this can impact efficient market outcomes.

However, a decision not to reinvest in this line, but remove it from service at end-of-life, will have a much greater impact on the market then just fuel cost savings. Signalling this to the market will not only impact the longer-term operability of the network but also result in an alternate market expansion. A lower CQ-SQ transfer capability will change the mix and location of generation expansion in the National Electricity Market (NEM) compared to if the existing transfer capability is maintained.

Market modelling was used to quantify market benefits of line refit work that would maintain the Woolooga to South Pine (807) 275 kV line in service. This involved simulating and comparing states of the world with the line maintained in service against a permanent removal of the line across a number of scenarios or sensitivities.

Analysis of plausible future scenarios shows market benefits of maintaining the Woolooga to South Pine feeder (807) in service range from $292 million - $382 million (present value of annual benefits to 2050).

A refit of this line would likely maintain it in operation for another 15 years.

Considering the line refit costs and market benefits over this timespan, net market benefits of between $67 million and $87 million can be expected.

Therefore, the recommended option to address the compliance, safety and network risks arising from the ageing asset is to maintain the existing network between Woolooga and South Pine and refit the at-risk assets to ensure ongoing compliance with Powerlink's Electricity Act, Electrical Safety Act and Electricity Safety Regulation obligations. Preserving the integrity of the CQ-SQ 275 kV lines and their associated transfer capacity also maintains system security and supports a more efficient market development pathway.

Table of Contents

1. Introduction

The coastal segment of the Central Queensland to South Queensland (CQ-SQ) intra-connector was established nearly 50 years ago, initially connecting Gladstone Power Station to the southern Queensland loads. Over time, this intra-connector has developed, with three single circuits between Calliope River and Woolooga, and two single circuits between Woolooga and South Pine.

This coastal transmission corridor is a major component of the CQ-SQ grid section and provides supply to Boyne Island, Wide Bay, and the Sunshine Coast loads.

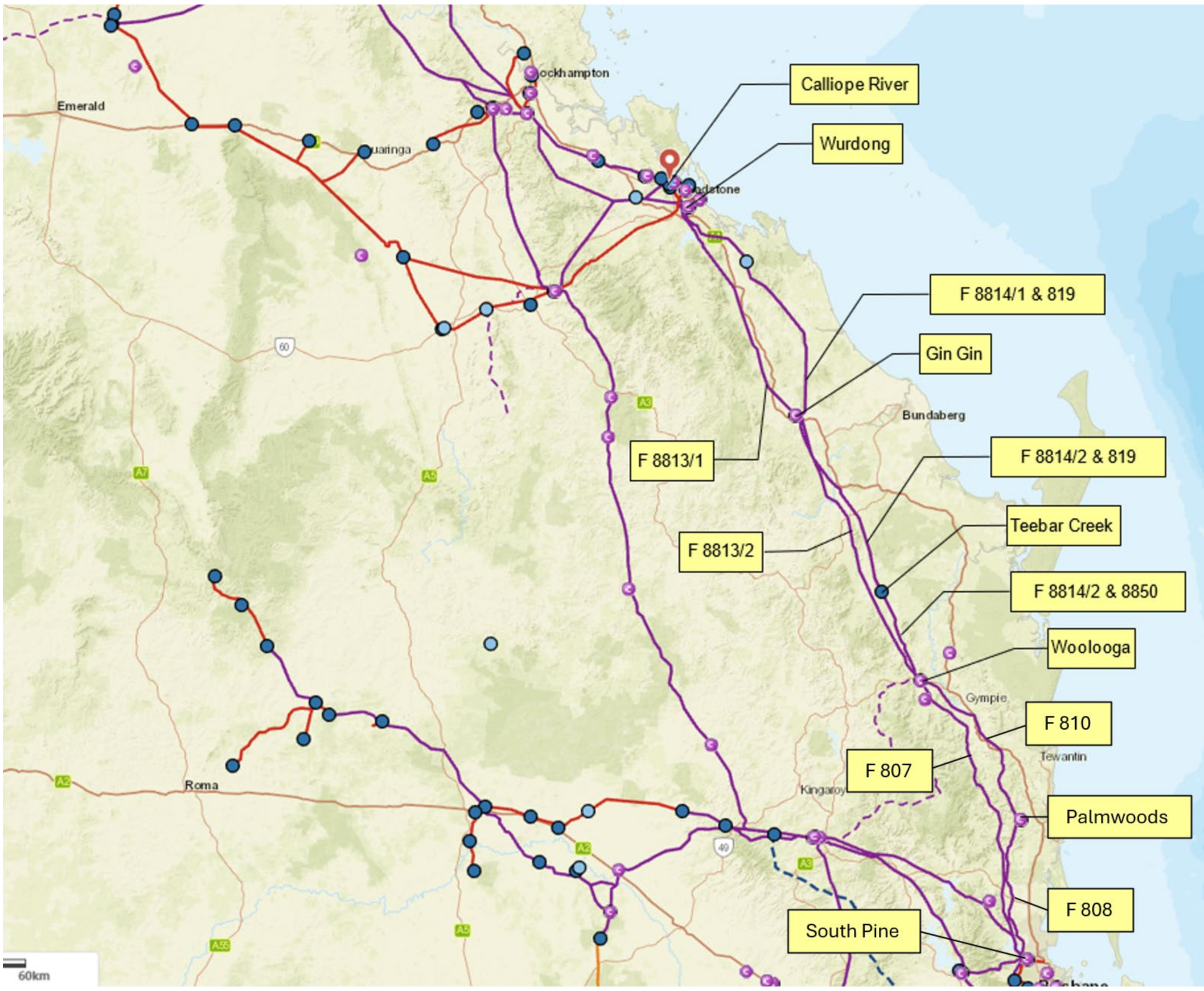


Figure 1. Central Queensland to Southern Queensland intra-connector coastal feeders.

Built Section 1020 is a single circuit 275kV feeder, identified as Feeder 807, which connects Powerlink's South Pine Substation in North Brisbane to Woolooga Substation located north of Gympie. A condition assessment of BS1020 [2] identified that certain parts of this built section have deteriorated and will reach end of life from 2028.

This condition driver has triggered the need to assess the enduring network need for Woolooga to South Pine (807 - BS1020).

The coastal 275kV circuits provide the required reliability of supply to the communities between Central and South Queensland. The circuits also provide power transfer capability for efficient market development, along with the western CQ-SQ corridor from Calvale to Halys.

The CQ–SQ coastal 275kV corridor is experiencing significant interest from renewable energy and storage developers, including a proposed pumped hydro energy storage (PHES) project and multiple BESS projects. These developments align with Queensland's decarbonisation objectives and support the transition to low-emission generation.

The need to maintain flexibility, when the energy transition and the need to supply "new economy" energy intensive loads has never been greater. For the coastal CQ-SQ corridor, flexibility means keeping the existing assets in-service (by targeted refits) and where economic to do so, increasing the utilisation and capacity through adoption of new technologies, such as real time ratings (RTR), and ground clearance rectification (GCR). This strategy offers a prudent and cost-effective pathway to extend the operational life and increase the capacity of the existing CQ-SQ 275kV coastal transmission corridor.

This report focuses on the critical investment in line asset refit works to preserving the integrity of the CQ-SQ 275 kV network and maintaining its current transfer capability. Without this investment increasing the capacity through RTR and GCR works will not be possible.

This assessment was done through market modelling. Market modelling was used to quantify market benefits of line refit work that would maintain the Woolooga to South Pine (807) 275 kV line in service. This involved simulating and comparing states of the world with the line maintained in service against a permanent removal of the line across a number of plausible scenarios or sensitivities.

2. Woolooga Grid Section

The Woolooga Grid Section is on the southern end of the CQ-SQ coastal 275kV circuits and supplies the Sunshine Coast area whilst providing power transfer capability into South East Queensland (SEQ). The feeders in this grid section include

- Feeder 807 from Woolooga to South Pine
- Feeder 810 from Woolooga to Palmwoods
- Feeder 747/2 from Woolooga to Gympie
- Feeder 748/2 from Woolooga to Gympie.

Figure 2 shows the existing connection configuration between the Wide Bay and Moreton North regions.

[redacted]

Figure 2. Wide Bay to Moreton 275/132/110kV Line Dagram

3. CQ-SQ power transfer capability

The maximum power transfer across the CQ-SQ grid section is currently set by transient or voltage stability limitations following a Calvale to Halys 275kV circuit contingency.

The voltage stability limit is set by insufficient reactive power reserves in the Central West and Gladstone zones following a contingency. More generating units online in these zones increase reactive power support and therefore transfer capability.

Historically the CQ-SQ coastal circuits have carried ~60% of the power transfer between Central and Southern Queensland. However, load growth in the Sunshine Coast area and the operation of variable renewable energy (VRE) plant connected to the coastal 275kV circuits are increasing that percentage to the extent that thermal limits (particularly between Woolooga and South Pine on Energy Queensland's (EQL) parallel 132kV network) are now becoming more limiting.

Failure or removal of the Woolooga to South pine 275k circuit (807) has a significant impact on this thermal capacity between Woolooga and South Pine substations. EQL's 132kV network between Woolooga and Gympie would need to be radialised. This puts additional power transfer on the remaining 275kV circuits. The resulting change in the CQ-SQ power transfer capacity is from 2100MW to 1500MW.

Furthermore, operation of additional committed and anticipated large-scale VRE and storage projects (BESS and potential PHES) will significantly increase the bias of power transfer on these coastal circuits. The impact that existing, committed and anticipated projects have on the thermal limitations have been captured in the market simulations by developing limit coefficients that reflects their impact on the thermal limits. These flow coefficients were quantified for both the case with 807 in-service and for the cases without 807.

4. Market benefit assessment

Market modelling was used to quantify market benefits of line refit work that would maintain the Woolooga to South Pine (807) 275 kV line in service. This involved simulating and comparing states of the world with the line maintained in service against a permanent removal of the line across a number of plausible scenarios or sensitivities.

The market benefit calculation is consistent with the regulatory investment test for transmission requirements that a market benefit "must be a benefit to those who consume, produce and/or transport electricity in the market, that is, the change in producer plus consumer surplus." Critically, a market benefit must not "include the transfer of surplus between consumers and producers".[1]

As such, the market impact is assessed by comparing the changes in costs due to differences in the timing and capital costs of new generation and storage resources, differences in the operational and maintenance costs (including fuel costs), changes in involuntary load shedding (at the value of customer reliability [VCR] [2]), and changes in greenhouse gas emissions (at the value of emissions reduction [VER] [3]).

The market modelling simulations considered committed and anticipated generators were commissioned on time, coal units closed according to their announced dates (as of December 2025), and modelled generation and storage projects consistent with the Queensland Energy Roadmap 2025.[4] The profiles of demand and energy available for variable energy resources followed the 2015 weather reference year as published by AEMO, as being a year found to result in 'median' outcomes.

A schedule of generator planned outages was modelled. However, generator forced outages were not considered. Instead, a reserve requirement is maintained via a reserve constraint equation, and therefore unserved energy may be underestimated in some circumstances.

The base market model models a flow path between Central to Southern Queensland which includes the combined flow of the coastal and inland circuits making up this flow path. Network analysis was used to develop additional network constraint equations to model the limitations specific to a network with 807 out of service compared with the network with 807 in service and incorporating the impact of generation connected to the coastal Central to Southern Queensland circuits.

[1] AER, November 2024, "Regulatory investment test for transmission", p4

[2] AER, December 2024, "Values of customer reliability: Final report on VCR values"

[3] AER, May 2024, "Valuing emissions reduction: AER guidance and explanatory statement"

[4] The State of Queensland (Queensland Treasury), October 2025, "Energy Roadmap"

5. Plausible market sensitivities

A Base Scenario and two sensitivities were developed with the aim to model plausible market development that stress-test system conditions that would result in regret if the Woolooga to South Pine circuit (807) was removed from service. These cases included:

- A base case that includes QNI Connect, assumed fully operational from July 2034. QNI Connect is an “actionable” project identified in AEMO’s 2024 Integrated System Plan (ISP). The actionable status of the project has been maintained in the 2026 Draft ISP. Powerlink and Transgrid are jointly working on the Regulatory Investment Test of Transmission (RIT-T) for this project.

- A sensitivity that adds in the Mt Rawdon Pumped Hydro project, as it is a project that would cause a significant change to the flows on this flow path and is currently under review by the Queensland Investment Corporation (QIC) and Queensland Treasury.

- A sensitivity that further adds potential additional load in Southern Queensland, as this would also be expected to add stress to this flow path. The additional load modelled is 500MW. Powerlink has a Contingent Project in North Brisbane linked to a digital computing application. This load could add XXXMW. In addition, New South Wales and Victoria are experiencing a significant surge in electricity demand due to the rapid expansion of data centre infrastructure. This surge is driven by demand for cloud services and AI infrastructure, requiring vast continuous power supplies and imposing pressure on grid capacity and connection timelines. It is more than plausible that Queensland may emerge as the next likely hotspot for data centre development. As NSW and Victoria reach grid connection limits. The addition of 500MW only of additional load could greatly underestimate this load expansion.

This is a limited scenario analysis to identify whether there are plausible futures with significant market benefits associated with the reinvestment in feeder 807.

Each sensitivity represents a state of the world. For each sensitivity, two models are run, one with feeder 807 and one without, to understand how that world might change. The market benefits of the line refit are then calculated as the total system cost differences of line 807 in service and out of service for each of the three cases. These were then discounted to 2025 using a discount rate of 7%.

6. Input assumptions

The Base Case assumptions are listed in Appendix A. Input assumptions not specified in the Appendix A are as per the Draft 2025 AEMO Input Assumptions and Scenario Report (IASR).

6.1 Committed and anticipated VRE connections to the coastal circuits

Further to the assumptions in Appendix A, Table 1 summarises the VRE and storage plant connected to the coastal 275kV circuits and modelled in the Base Case and Sensitivities. Only one plant (Lower Wonga BESS) has been modelled that has not yet committed[5].

In addition to these projects there are many other VRE and storage projects that potentially could connect to this coastal network. These projects are not yet committed and are in various stages of market development. Table 2 summarises the potential aggregate capacity by project type. Table 2 is included to demonstrate that the plant modelled in the market analysis is by no means optimistic.

Table 1. Modelled VRE and storage projects on the coastal 275kV circuits

Plant	Type	Size (MW / MWh)	Status
Woolooga Energy Park	Solar Farm	176	Commissioned
Childers	Solar Farm	56	Commissioned
Munna Creek	Solar Farm	120	Commissioned
Bundaberg	Solar Farm	78	Committed
Bullyard	Solar Farm	97	Committed
Banksia	Solar Farm	60	Committed
Aramara	Solar Farm	104	Committed
Susan River	Solar Farm	75	Committed
Woolooga	BESS	200 / 400	Committed
Lower Wonga	BESS	200 / 400	Anticipated

Table 2. Potential pipeline of projects

Plant Type	Aggregate Size (MW)	Development Status
Pumped Hydro	1550	Application Received
BESS	1920	Application Received
BESS + Solar farm	3366	Application Received
Pumped Hydro	600	Market Development
BESS	3880	Market Development
BESS + Solar Farm	2400	Market Development
Solar Farm	376	Market Development
Wind farm	2473	Market Development

[5] Subsequent to this analysis being finalised the Lower Wonga Hybrid plant was committed. The solar part is 281MW and design of the DC coupled BESS is 281MW / 562MWh/

7. Results

Figure 3 demonstrates a summary of market benefits of the modelled scenarios.

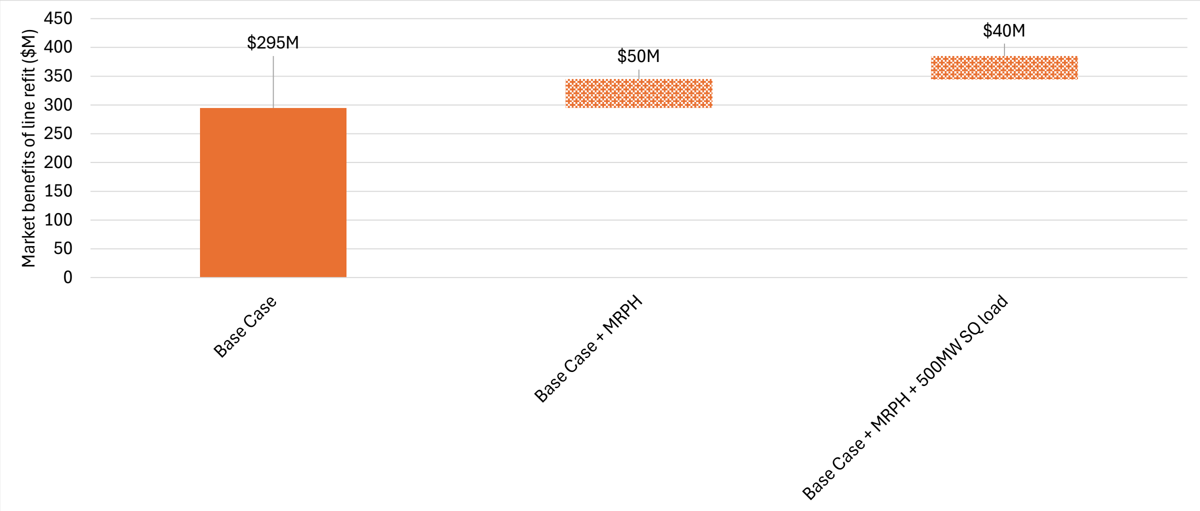


Figure 3. Summary of market benefits of Base Case and Sensitivities

Figure 4 shows the break-down of the market benefits provided by feeder 807 for each of the cases investigated.

Classes of benefits considered include:

- Annualised build cost – benefits from either deferring investment in new capacity or more efficient capital expenditure.
- Variable and fixed operational cost – including variable operation and maintenance (VOM), fixed operation and maintenance (FOM) and fuel costs
- Value of Emissions Reduction – the value of emissions reduction is considered as per published advice from the AER6.
- Fuel cost – market benefit from changes in total consumed fuel cost in the system.

The market benefits were calculated by subtracting the costs incurred in the case with 807 in service from the higher system costs of 807 out of service. These are then discounted to 2025 using a discount rate of 7%.

[6] See: www.aer.gov.au/system/files/2024-05/AER%20-%20Valuing%20emissions%20reduction%20-%20Final%20guidance%20and%20explanatory%20statement%20-%20May%202024.pdf

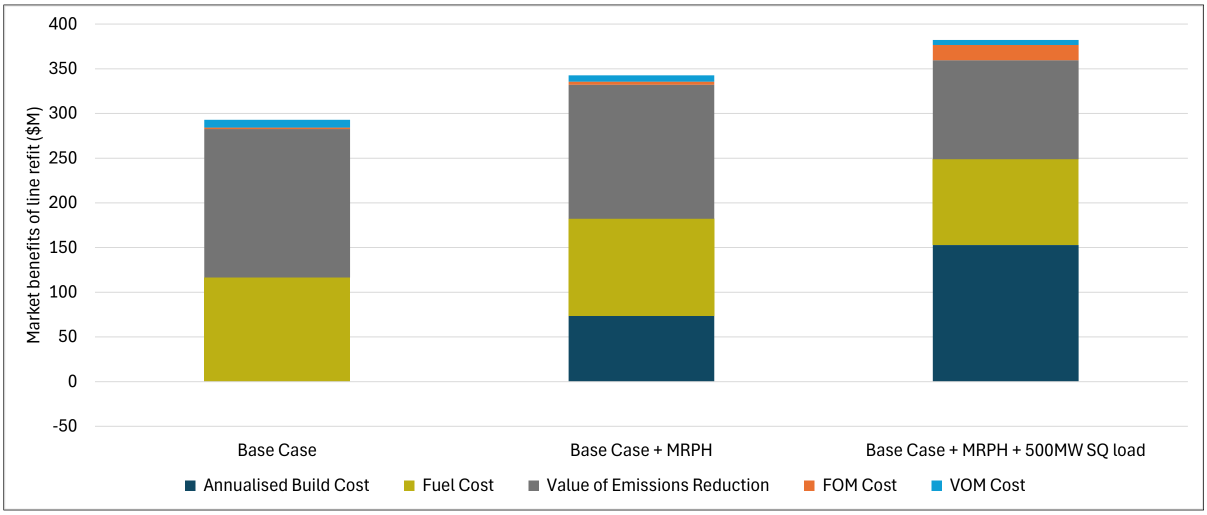


Figure 4. Market benefits provided by feeder 807 for each of the sensitivities investigated.

The dynamics leading to these benefits are consistent across all cases, and the additional CQSQ capacity provided by feeder 807 drives value because without this line:

- The generation capacity expansion is less efficient. There is less wind capacity built in Northern Queensland, and more replacement capacity built in Southern Queensland and in New South Wales. Some of the replacement capacity in Southern Queensland and New South Wales violates the resource limit7 and attracts additional social licensing and land preparation related costs. These are included in the annual build cost in the presented market benefits.

- More gas and coal generation is required. This leads to higher fuel cost and more greenhouse gas emissions.

Figure 5 shows that the market benefits that feeder 807 provides are low until the late 2030s, when they increase substantially. From 2038, the difference in capacity build and generation outcomes becomes meaningful between cases with and without feeder 807 in service. These differences are driven by the combination of QNI Connect (FYE 2035) and retirement of coal-powered units across both New South Wales and Queensland during this time. This leads to both a higher need to replace generation that withdraws, with the additional opportunity for optimisation with QNI Connect and the additional CQSQ capacity if feeder 807 is retained.

[7] A limit beyond which development attracts additional cost as per AEMO's assumptions in the 2025 Input Assumptions and Scenarios Report.

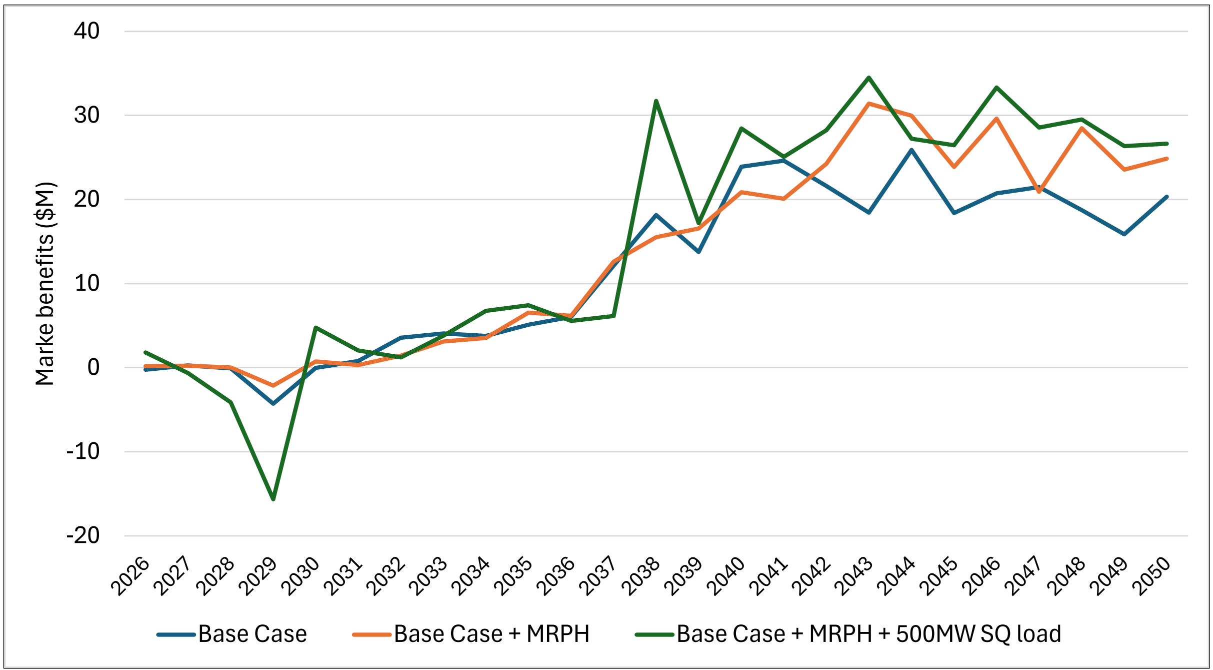


Figure 5. Timing of benefits provided by feeder 807 being in service across the cases investigated.

The flow duration curve in 6 demonstrates the impact of feeder 807 in providing increased CQSQ capacity.

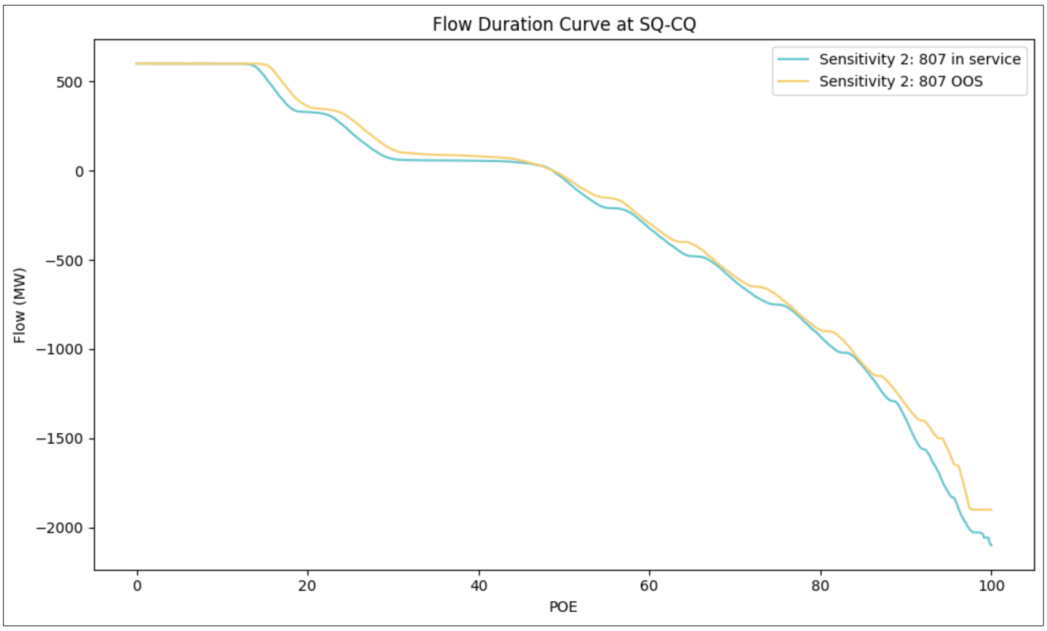


Figure 3 – SQCQ flow duration curve for sensitivity

8. Cost Benefit

The cost benefit analysis presented here is illustrative using approximate costs and timeframes. A more detailed cost-benefit analysis may be included in Powerlink's Planning statement for this line refit work.

For this analysis, it has been assumed that staged refit works on selected structures is the preferred option to extend the service life of the Woolooga to South Pine 275kV transmission line for a further 15 years. The

Considering both costs and benefits on the same basis (annualised and discounted), Table 3 shows that there is net benefit in reinvestment in the Woolooga to South Pine line (807) to 2042 in the modelled scenarios.

Table 1: Market benefits and costs of line refit by 2042.

Case	Benefits to 2042	Costs to 2042	Net Benefits to 2042
Base Case	$133 million	$82 million	$51 million
Sensitivity 1	$129 million	$82 million	$47 million
Sensitivity 2	$149 million	$82 million	$67 million

9. Recommendations

The recommended option to address the compliance, safety and network risks arising from the ageing asset is to maintain the existing network between Woolooga and South Pine and refit the at-risk assets to ensure ongoing compliance with Powerlink's Electricity Act, Electrical Safety Act and Electricity Safety Regulation obligations.

Preserving the integrity of the CQ-SQ 275 kV lines and their associated transfer capacity also maintains system security and supports a more efficient market development pathway.

10. References

1. BS1020 South Pine – Woolooga Transmission Line Condition Assessment Report 2025
2. Transmission Annual Planning Report 2024
3. Asset Planning Criteria Framework

11. Appendix A – Market Benefit Input Assumptions

Base Case assumptions are listed in the table below. Input assumptions not specified in the table are as per the Draft 2025 IASR.

Table 2. Base Case assumptions

<table>
<tr><th>Property</th><th>Setting</th></tr>
<tr><td>Horizon</td><td>1/7/2025 – 30/6/2050</td></tr>
<tr><td>Coal closures</td><td>Announced retirement schedule
Callide B1: 1/7/2031
Callide B2: 1/7/2031
All Gladstone units: 1/7/2029</td></tr>
<tr><td>Fixed project list</td><td>Committed and Anticipated projects as used in the Energy Roadmap modelling (July 2025)</td></tr>
<tr><td>WRY</td><td>2015</td></tr>
<tr><td>Model type</td><td>8LB capacity expansion</td></tr>
<tr><td>Demand Traces</td><td>2025 Draft IASR</td></tr>
<tr><td>Existing Line limits</td><td>SQ-CQ (and as adjusted by constraints in Table 2)
North: 600MW[8]
South: 2100 MW
CQ North
North: 1400MW
South:
800MW
1300MW from 1/7/2032 (enabled by stringing second side of Stanwell Broadsound)</td></tr>
<tr><td>Transmission Augmentations</td><td>CopperString – 1/7/2031
CQ-North Incremental Expansion – 1/7/2032
North-Ross Incremental Expansion – 1/7/2033</td></tr>
<tr><td>Constraints</td><td>Constraints to represent current state of Gladstone from start of horizon until 1/7/2029. Constraints turned off post 1/7/2029
SWQLD1 as per Roadmap modelling
Other REZ resource limit constraints as per Roadmap modelling</td></tr>
<tr><td>Constraints to represent impact of line 807 status on CQ to SQ flow limit</td><td>See Table 2</td></tr>
<tr><td>Additional assumptions</td><td>NSW data centre load included based on the Draft ISP 2026
QNI Connect, identified as “actionable in the 2024 ISP, requiring ongoing analysis” in the Draft ISP 2026</td></tr>
</table>

The market benefits were calculated by subtracting the costs incurred in the cases with 807 in service from the higher system costs in the cases with 807 out of service. These were then discounted to 2025 using a discount rate of 7%.

[8] Note that the increase in SQ-CQ limit to 1100MW from 1/4/2029 enabled by augmentations at Karana Downs will be excluded in the Base Case.

Table 3. Constraint equations to represent line 807 in service or out of service impact on CQ to SQ flow limit

807 in service
$\mathbf{CQSQ \le 1966 + 0.88(MRPH_{gen} - MRPH_{load}) + 0.59(Woolooga.BESS_{gen} - Woolooga.BESS_{load}) + 0.59(Lower\ Wonga.BESS_{gen} - Lower\ Wonga.BESS_{load}) + 0.59(WooloogaREZ)}$ $\mathbf{CQSQ \le 2206 - 1.45(MRPH_{gen} - MRPH_{load}) - 1.73(Woolooga.BESS_{gen} - Woolooga.BESS_{load}) - 1.73(Lower\ Wonga.BESS_{gen} - Lower\ Wonga.BESS_{load}) - 1.73(WooloogaREZ)}$ $\mathbf{CQSQ \le 2100}$
807 out of service
$\mathbf{CQSQ \le 1500 - 1.3(MRPH_{gen} - MRPH_{load}) - 1.6(Woolooga.BESS_{gen} - Woolooga.BESS_{load}) - 1.6(Lower\ Wonga.BESS_{gen} - Lower\ Wonga.BESS_{load}) - 1.6(WooloogaREZ)}$ $\mathbf{CQSQ \le 1900}$

Project Scope Report

CP.02818

BS 1020 Woolooga – South Pine 275kV Line Refit

Concept – Version 2

Document Control

Change Record

Issue Date	Revision	Prepared by	Reviewed by	Approved by	Background
17/6/2025	1	[redacted]	[redacted]	[redacted]	Initial issue
22/10/2025	2	[redacted]	[redacted]	[redacted]	Additional option included

Related Documents

Issue Date	Responsible Person	Objective Document Name
26/03/2025	[redacted]	BS1020 South Pine - Woolooga Transmission Line Condition Assessment - Report (A5807750)
10/06/2025	[redacted]	CP.02818 – Project Initiation Form – BS 1020 South Pine to Woolooga (A3359355)

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

Project Details

1. Project Need & Objective

Built Section 1020 is a 160 km long 275kV single circuit transmission line between Powerlink's South Pine Substation (H002) and Woolooga Substation (H005). It has 356 structures in total and carries Feeder 807. The line was built in 1972 and since 2013 has required significant operational expenditure to address high levels of corrosion.

The levels of corrosion along the line are variable. Most of the line can be classified as corrosion category C, however, a pocket of structures in the vicinity of Maleny/Montville are suffering from much higher levels of corrosion, more in line with corrosion region D or E. Refer to Attachment 1 for a list of structures in high corrosion areas.

The transmission line has, as a result, required intensive maintenance particularly in this localised area, in the form of bolt replacement, attachment plate repairs, hardware replacement and some earth wire replacement. Localised bolt painting (spraying) by maintenance crews with cold-gal paint was also carried out in 2015 approximately, but this is not likely to provide long term protection for the bolts.

Condition assessments undertaken in 2016 identified that further intensive maintenance would be required to address condition issues on a number of structures, to ensure that the risk of a structural failure remains acceptably low. Further inspections and repairs have been carried out in 2019, but as this type of maintenance only addresses grade 4 corrosion (and grade 3 corrosion where it is efficient to do so), it is anticipated that a reasonably high level of ongoing maintenance work will be required if no life extension project is carried out on the asset.

A formal Condition assessment was carried out in 2020 (A3311034) and again in 2025 (A5795070) to better define the current corrosion levels of different sections. This concluded that the line would exceed health index HI8 by financial year 2028, and it is recommended that a capital life extension project is carried out, to bring all aspects of the line back to serviceable condition and ensure that all aspects remain in good condition for 15 years.

Because of the variable condition of line structures, it is expected that the amount of structure work will vary significantly along the line, with some structures only requiring replacement of a few bolts in specific locations, while others will require a large number of bolt and some member replacements, or localised structure painting, to achieve the 15-year requirement. A built section refit could be completed in a single or in multiple stages depending on the most economic option, largely driven by bundling efficiencies compared with economic savings through capital deferral.

The proposal for life extension of 15 years is intended to provide time to assess the long term capacity and other planning requirements for this route, and to fully explore and cost options for further life extension or for replacement of this and a parallel feeder, with a new double circuit line.

It is also intended that the proposed capital project addresses all other aspects of the line which will be required for the line to remain serviceable until between 2035 and 2040. This will include replacement of suspension hardware, replacement of all remaining original tension and bridging insulators and hardware, and replacement of any remaining earthwire and hardware with medium to advanced corrosion. It is noted that some earthwire, some tension insulators, bridging insulators and all suspension insulators, as well as many structure nuts and bolts have already been replaced.

The line primarily utilises S2S2 suspension structures, which are deemed under current Australian Standards to have an insufficient climbing corridor. This has a very significant impact on many activities, and it is proposed that options to alleviate the problem are reviewed under this project.

The objective of this project is to refit sections of BS1020 275kV transmission line between Woolooga and South Pine by 30 June 2032.

2. Project Drawing

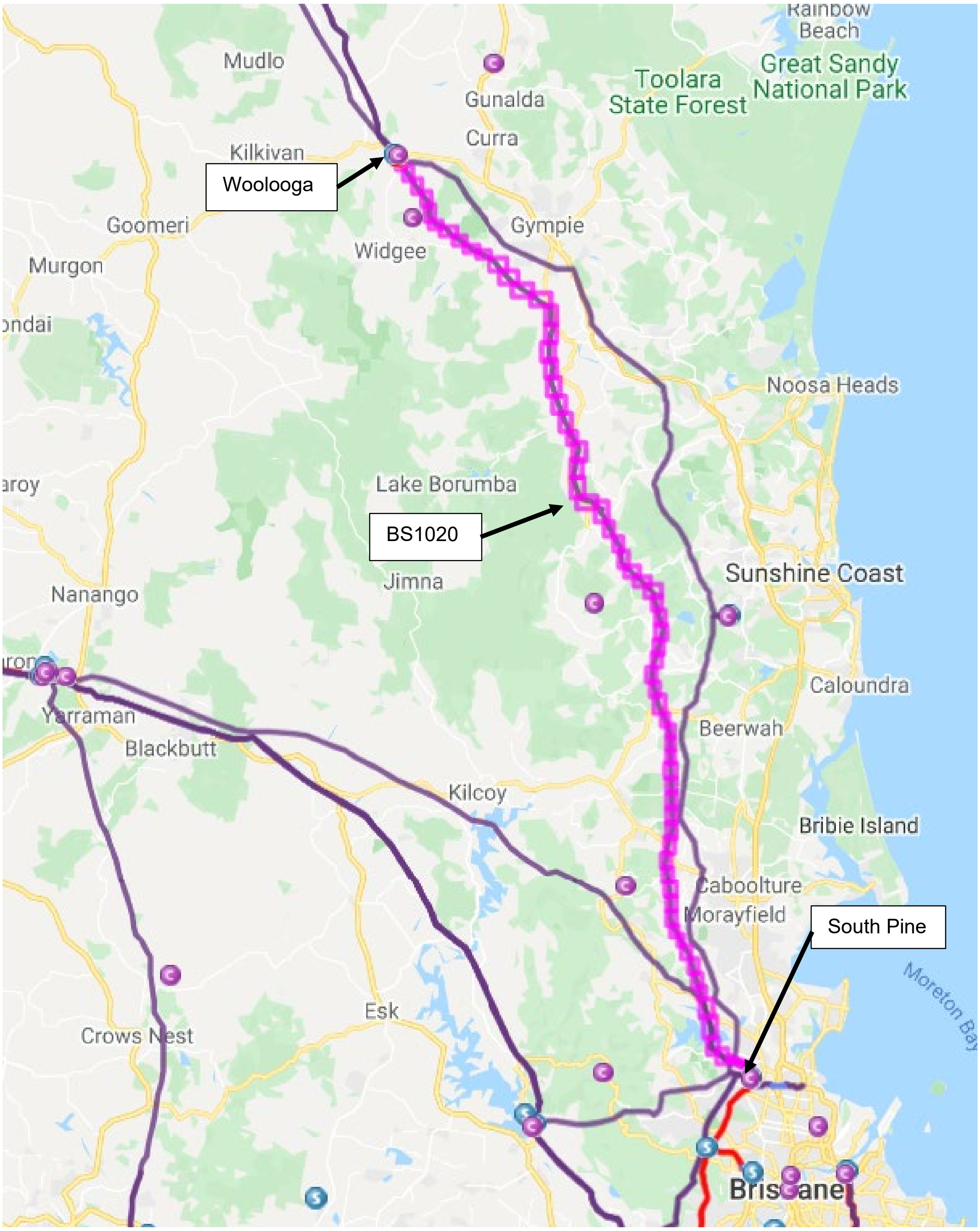


Figure 1: Geographical Location

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:

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 *Section 7 Special Considerations*.

Briefly, the project consists of undertaking selective refit of BS1020 Woolooga to South Pine 275kV transmission line to extend its service life by 15 years.

The below scope has been developed using 2025 data, which includes approximately 47% of the structural condition data.

Three credible options have been identified to refit BS1020, 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 254 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage, climbing attachments and structure earthing. Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.	June 2032
2	1	Refit of 114 structures including all G3 and G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only). Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.	June 2032
3	1	Refit of 62 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only). Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.	June 2032
	2*	Refit of 15 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers,	June 2037

		signage and structure earthing (Health index 8 or above structures only).	
	3*	Refit of 37 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only).	June 2042

*For Option 3, stages 2 and 3 would be carried out under separate projects, however, estimation of these stages is required to enable economic assessments to confirm the preferred option.

4.1. Option 1 – Refit BS1020 by 2032 - Transmission Line Works

Undertake transmission line refit works on Built Section 1020 as follows:

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP. Ensure photographs are taken and stored under the BS number in M Drive, to record the condition.

- Review and upgrade access tracks as necessary to enable contractor access for works on the built section. Note that some locations may only require four-wheel drive access, while some will require heavy vehicle access.

- Review options for resolution of the live climbing restriction on S2S2 and S2S0 towers and implement a solution if cost effective. If a solution can be found, replace all step bolts on all towers to comply with current Powerlink standards. If no climbing solution can be found, only replace corrosion grade 3 and 4 step bolts.

- Replacement of corroded OHEW from 1020-STR-4000. Number of spans to be replaced will require confirmation following the detailed inspection and review, but for estimating purposes, assume replacement to 1020-STR-4005. Size of OHEW will be determined by the fault levels.

- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion. Project should address known issue of corroded corona bar fasteners.

  For estimation purposes, assume 970 tension strings, 6 bridging strings and 2 restraint bridging strings require replacement as listed in Attachment 3.

- Replace tower members and fasteners with G3 corrosion and above.

  Assume an average of approximately 20% of fasteners and 2% of members on 254 of the 358 structures. Seek engineering advice for the replacement of any members. If prime members cannot be replaced, surface preparation and localized painting shall be carried out.

- Repair foundation interfaces of affected structures where required. (assume 5%)

- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications. (Refer Attachment 2 - assume 15%)

- Repair/replace damaged anticlimbing barriers and faded signage on affected structures. (assume 25%)

- 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 – Refit BS1020 by 2032 - Transmission Line Works

Undertake staged transmission line refit works on built section BS1020 as follows:

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP. Ensure photographs are taken and stored under the BS number in M Drive, to record the condition.

- Review and upgrade access tracks as necessary to enable contractor access for works on the built section. Note that some locations may only require four-wheel drive access, while some will require heavy vehicle access.

- Review options for resolution of the live climbing restriction on S2S2 and S2S0 towers and implement a solution if cost effective. If a solution can be found, replace all step bolts on all towers to comply with current Powerlink standards. If no climbing solution can be found, only replace corrosion grade 3 and 4 step bolts.

- Replacement of corroded OHEW from 1020-STR-4000. Number of spans to be replaced will require confirmation following the detailed inspection and review, but for estimating purposes, assume replacement to 1020-STR-4005. Size of OHEW will be determined by the fault levels.

- Replace remaining insulators original to the line and original hardware exhibiting G3 and above corrosion. Project should address known issue of corroded corona bar fasteners.

  Assume 970 tension strings, 6 bridging strings and 2 restraint bridging strings. Refer Attachment 3.

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above.

  Assume an average of approximately 45% of fasteners and 2% of members on 114 of the 358 structures. Seek engineering advice for the replacement of any members. If prime members cannot be replaced, surface preparation and localized painting shall be carried out.

- Repair foundation interfaces of affected structures where required. (assume 5%)

- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications. (Refer Attachment 2 - assume 15%)

- Repair/replace damaged anticlimbing barriers and faded signage on affected structures. (assume 25%)

- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

4.3. Option 3 – Staged Refit of BS1020 - Transmission Line Works

Undertake staged transmission line refit works on built section BS1020 as follows:

Stage 1 by 2032

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP. Ensure photographs are taken and stored under the BS number in M Drive, to record the condition.

- Review and upgrade access tracks as necessary to enable contractor access for works on the built section. Note that some locations may only require four-wheel drive access, while some will require heavy vehicle access.

- Review options for resolution of the live climbing restriction on S2S2 and S2S0 towers and implement a solution if cost effective. If a solution can be found, replace all step bolts on all towers to comply with current Powerlink standards. If no climbing solution can be found, only replace corrosion grade 3 and 4 step bolts.

- Replacement of corroded OHEW from 1020-STR-4000. Number of spans to be replaced will require confirmation following the detailed inspection and review, but for estimating purposes, assume replacement to 1020-STR-4005. Size of OHEW will be determined by the fault levels.

- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion. Project should address known issue of corroded corona bar fasteners.

  Assume 970 tension strings, 6 bridging strings and 2 restraint bridging strings. Refer Attachment 3.

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above.

  Assume an average of approximately 50% of fasteners and 2% of members on 62 of the 358 structures. Seek engineering advice for the replacement of any members. If prime members cannot be replaced, surface preparation and localized painting shall be carried out.

- Repair foundation interfaces of affected structures where required. (assume 5%)

- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications. (Refer Attachment 2 - assume 15%)

- Repair/replace damaged anticlimbing barriers and faded signage on affected structures. (assume 25%)

- 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 2037

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above.

  For estimation purposes assume an average of approximately 40% of fasteners and 1% of members on 15 of the 358 structures. Seek engineering advice for the replacement of any members. If prime members cannot be replaced, surface preparation and localized painting shall be carried out.

- Repair foundation interfaces of affected structures where required. (assume 5%)

- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications. (Refer Attachment 2 - assume 15%)

- Repair/replace damaged anticlimbing barriers and faded signage on affected structures. (assume 25%)

- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

Stage 3 by 2042

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above.

  For estimation purposes assume an average of approximately 40% of fasteners and 1% of members on 37 of the 358 structures. Seek engineering advice for the replacement of any members. If prime members cannot be replaced, surface preparation and localized painting shall be carried out.

- Repair foundation interfaces of affected structures where required. (assume 5%)

- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings as required, resolve any high earth resistances to target maintenance values and perform a detailed engineering analysis of any identified high-risk locations that have not been resolved in accordance with the specifications. (Refer Attachment 2 - assume 15%)

- Repair/replace damaged anticlimbing barriers and faded signage on affected structures. (assume 25%)

- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

4.4. Substation Works

Confirm whether replacement of OHEW has any impact on feeder impedances for modelling/protection purposes.

4.5. Telecoms Works

Not applicable

4.6. 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.

4.7. 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 2032.

6. Special Considerations

The long-term future of BS1020 has not been fully determined, however there is an enduring need for high-capacity transfer on the 275kV CQ-SQ interconnector, which currently has primarily single circuit lines. Any replacement of existing lines would ideally replace two single circuit lines with a single double circuit line to reduce maintenance costs and it is noted that an easement suitable for construction of a double circuit line has been procured for almost the complete route between South Pine and Woolooga, currently occupied by BS1021 and BS1048. BS1021 is currently estimated to reach end of life in the early 2030s, while BS1048 has been refitted and will now reach end of life in the mid to late 2030s.

Area planning is required to confirm the most appropriate strategy to manage the expected need for increased transfer capacity and asset condition risks associated with the existing built sections.

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: Structures in high corrosion areas

The 51 structures listed below, based on condition assessment, are believed to be in high corrosion areas and will require more extensive refurbishment. This list shall be used as a guide only for the purposes of estimating and additional structures throughout the built section may also require a high level of intervention. The final scope of work is to be confirmed by detailed inspection of all structures.

1020-STR-4001	STRUCTURE S2T70+60
1020-STR-4002	STRUCTURE S2T70+60
1020-STR-4003	STRUCTURE S2T5+50
1020-STR-4130	STRUCTURE S2S0-20
1020-STR-4131	STRUCTURE S2T40-10
1020-STR-4132	STRUCTURE S2T5-0
1020-STR-4133	STRUCTURE S2S0+10
1020-STR-4134	STRUCTURE S2S0+10
1020-STR-4135	STRUCTURE S2S2+10
1020-STR-4136	STRUCTURE S2T5+20
1020-STR-4137	STRUCTURE S2S2+10
1020-STR-4138	STRUCTURE S2T40+10
1020-STR-4139	STRUCTURE S2S2-20
1020-STR-4140	STRUCTURE S2S2-10
1020-STR-4141	STRUCTURE S2S2-0
1020-STR-4142	STRUCTURE S2S2+20
1020-STR-4143	STRUCTURE S2S2-10
1020-STR-4144	STRUCTURE S2S2+30
1020-STR-4145	STRUCTURE S2S2+20
1020-STR-4146	STRUCTURE S2T5-20
1020-STR-4147	STRUCTURE S2T40+40
1020-STR-4148	STRUCTURE S2T5+40
1020-STR-4149	STRUCTURE S2T40+40
1020-STR-4150	STRUCTURE S2S0+10
1020-STR-4151	STRUCTURE S2S2+10
1020-STR-4152	STRUCTURE S2S0-0
1020-STR-4153	STRUCTURE S2T5-0
1020-STR-4154	STRUCTURE S2S2-0
1020-STR-4155	STRUCTURE S2S2+30
1020-STR-4156	STRUCTURE S2T5-0
1020-STR-4157	STRUCTURE S2S0+20
1020-STR-4158	STRUCTURE S2S2+10
1020-STR-4159	STRUCTURE S2S2+30
1020-STR-4160	STRUCTURE S2S0-10
1020-STR-4161	STRUCTURE S2S2-0
1020-STR-4162	STRUCTURE S2T40+10
1020-STR-4163	STRUCTURE S2T5-20
1020-STR-4164	STRUCTURE S2T40-0
1020-STR-4165	STRUCTURE S2S0+30
1020-STR-4166	STRUCTURE S2T5-10
1020-STR-4167	STRUCTURE S2S2+10
1020-STR-4168	STRUCTURE S2S2-0
1020-STR-4169	STRUCTURE S2S2+20
1020-STR-4170	STRUCTURE S2S2+20
1020-STR-4171	STRUCTURE S2S2-10
1020-STR-4172	STRUCTURE S2S0-20
1020-STR-4173	STRUCTURE S2S2+10
1020-STR-4174	STRUCTURE S2S2+10
1020-STR-4175	STRUCTURE S2S2-10
1020-STR-4176	STRUCTURE S2S0-10
1020-STR-4177	STRUCTURE S2T40-10

Attachment 2: Gradient Ring installation and footing resistance testing

Structure	Gradient Ring installed	Action	Classification
1020-STR-4000	Yes	Test footing resistance	Urban
1020-STR-4001	No	Install grading ring	Urban
1020-STR-4002	No	Install grading ring	Urban
1020-STR-4003	No	Install grading ring	Urban
1020-STR-4004	No	Install grading ring	Backyard
1020-STR-4005	No	Install grading ring	Urban
1020-STR-4006	No	Install grading ring	Urban
1020-STR-4007	No	Install grading ring & Test footing resistance	Urban
1020-STR-4008	Yes	Test footing resistance	Urban
1020-STR-4009	Yes	Test footing resistance	Urban
1020-STR-4010	Yes	Test footing resistance	Urban
1020-STR-4011	No	Test footing resistance	Urban
1020-STR-4012	No	Test footing resistance	Urban
1020-STR-4013	No	Test footing resistance	Urban
1020-STR-4014	No	Test footing resistance	Urban
1020-STR-4015	Yes	Test footing resistance	Urban
1020-STR-4016	No	Test footing resistance	Remote
1020-STR-4017	No	Test footing resistance	Remote
1020-STR-4018	No	Test footing resistance	Remote
1020-STR-4019	No	Test footing resistance	Remote
1020-STR-4020	No	Test footing resistance	Remote
1020-STR-4021	Yes	Test footing resistance	Remote
1020-STR-4022	Yes	Test footing resistance	Remote
1020-STR-4023	No	Test footing resistance	Remote
1020-STR-4024	Yes	Test footing resistance	Remote
1020-STR-4025	Yes	Test footing resistance	Remote
1020-STR-4026	No	Test footing resistance	Remote
1020-STR-4027	No	Test footing resistance	Remote
1020-STR-4028	No	Test footing resistance	Remote
1020-STR-4029	No	Test footing resistance	Remote
1020-STR-4030	No	Test footing resistance	Remote
1020-STR-4031	Yes	Test footing resistance	Remote
1020-STR-4032	Yes	Test footing resistance	Remote
1020-STR-4033	No	Test footing resistance	Remote
1020-STR-4034	Yes	Test footing resistance	Remote
1020-STR-4035	No	Test footing resistance	Remote

1020-STR-4036	No	Test footing resistance	Remote
1020-STR-4037	No	Test footing resistance	Remote
1020-STR-4038	No	Test footing resistance	Remote
1020-STR-4039	No	Test footing resistance	Remote
1020-STR-4040	No	Test footing resistance	Remote
1020-STR-4041	No	Test footing resistance	Remote
1020-STR-4042	No	Test footing resistance	Remote
1020-STR-4043	Yes	Test footing resistance	Remote
1020-STR-4044	Yes	Test footing resistance	Remote
1020-STR-4045	Yes	Test footing resistance	Remote
1020-STR-4046	Yes	Test footing resistance	Remote
1020-STR-4047	No	Test footing resistance	Remote
1020-STR-4048	Yes	Test footing resistance	Remote
1020-STR-4049	No	Test footing resistance	Remote
1020-STR-4143	No	Install grading ring	Aquatic
1020-STR-4146	No	Install grading ring	Backyard
1020-STR-4155	No	Install grading ring	Backyard

Attachment 3: Insulators to be replaced

FUNLOC	DESCRIPTION	INSTALLED	NO OF DISCS	QTY
1020-STR-4000-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4003-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4009-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4011-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4020-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	10
1020-STR-4022-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4035-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4036-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4037-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4045-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4050-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4054-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4055-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4065-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4066-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4072-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4076-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4086-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4097-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4098-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4099-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4100-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4106-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4107-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4131-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4132-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4136-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4138-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4146-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4147-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4148-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4178-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4180-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4183-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4190-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4196-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4198-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4200-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4209-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4210-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4212-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4214-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4217-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12

1020-STR-4223-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4224-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4229-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4233-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4238-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4239-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4254-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4255-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4257-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4259-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4262-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4266-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4272-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4277-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4278-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4280-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4282-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4284-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4289-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4290-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4292-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4299-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4307-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4308-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4314-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4315-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4316-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4327-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4328-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4329-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4330-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4334-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4336-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4337-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4354-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-4355-INSTEN_A	NGK NORMAL DISC 125kN TENSION	1972	18	12
1020-STR-GN02-INSTEN_A	NGK FOG DISC 125kN TENSION	1972	18	6
1020-STR-GN03-INSTEN_A	NGK FOG DISC 125kN TENSION	1972	18	6
1020-STR-H002-INSBEA_A	NGK NORMAL DISC 125kN TENSION	1972	18	6
1020-STR-H005-INSBEA_A	NGK NORMAL DISC 125kN TENSION	1972	18	6
1020-STR-GN02-INSBDG_A	NGK FOG DISC 125kN BRIDGING	1976	17	3
1020-STR-GN03-INSBDG_A	NGK FOG DISC 125kN BRIDGING	1976	17	3
1020-STR-4327-INSBDG_A	NGK NORMAL DISC 125kN RESTRAINT BRIDGING	1972	17	2
			TOTAL	**978**

CP.02818 BS1020 Woolooga – South Pine 275kV Line Refit

Concept Estimate

Table of Contents

1. Executive Summary

This Concept Estimate document has been developed based on the CP.02818 Built Section (BS) 1020 Woolooga – South Pine 275kV Line Refit Project Scope Report (PSR).

Built Section 1020 is a 160 km long 275kV single circuit transmission line between Powerlink's South Pine Substation (H002) and Woolooga Substation (H005). It has 358 structures in total and carries Feeder 807. The line was built in 1972 and since 2013 has required significant operational expenditure to address high levels of corrosion due to climate conditions. The levels of corrosion along the line are variable. Most of the line can be classified as corrosion category C, however, a pocket of structures in the vicinity of Maleny/Montville are suffering from much higher levels of corrosion, more in line with corrosion region D or E. As a result, the transmission line has required intensive maintenance in the form of bolt replacement, attachment plate repairs, hardware replacement and some earth wire replacement.

A formal Condition assessment was carried out in 2020 and again in 2025 to better define the current corrosion levels of different sections. This concluded that the line would exceed health index HI8 by financial year 2028, and it is recommended that a capital life extension project is carried out, to bring all aspects of the line back to serviceable condition and ensure that all aspects remain in good condition for 15 years.

Because of the variable condition of line structures, it is expected that the amount of structure work will vary significantly along the line, with some structures only requiring replacement of a few bolts in specific locations, while others will require a large number of bolt and some member replacements, or localised structure painting, to achieve the 15-year requirement. A built section refit could be completed in a single or in multiple stages depending on the most economic option, largely driven by bundling efficiencies compared with economic savings through capital deferral.

The proposal for life extension of 15 years is intended to provide time to assess the long-term capacity and other planning requirements for this route, and to fully explore and cost options for further life extension or for replacement of this and a parallel feeder, with a new double circuit line.

It is also intended that the proposed capital project addresses all other aspects of the line which will be required for the line to remain serviceable until between 2035 and 2040. This will include replacement of suspension hardware, replacement of all remaining original tension and bridging insulators and hardware, and replacement of any remaining earthwire and hardware with medium to advanced corrosion. It is noted that some earthwire, some tension insulators, bridging insulators and all suspension insulators, as well as many structure nuts and bolts have already been replaced.

The line refit could be completed in a single or in multiple stages depending on the most economic option, largely driven by bundling efficiencies compared with economic savings through capital deferral.

Three credible options have been identified for refitting BS 1020 as below:

Option	Stage	Works
1	1	Refit of 254 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage, climbing attachments and structure earthing. Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.
2	1	Refit of 114 structures including all G3 and G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only). Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.
3	1	Refit of 62 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only). Replacement of all remaining insulators and G3 or G4 insulator hardware that are original to the line and OHEW to enable safe refit works.
	2	Refit of 15 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only).
	3	Refit of 37 structures including all G3 or G4 fasteners and members, repair of foundations and upgrade of anti-climb barriers, signage and structure earthing (Health index 8 or above structures only).

The line primarily utilises S2S2 suspension structures, which are deemed under current Australian Standards to have an insufficient climbing corridor. All climbing inspection and refit activities are to be conducted under outages.

The assessment in this proposal has established that the project can be delivered by January 2032 for Option 1, March 2032 for Option 2 and by January 2042 for Option 3.

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

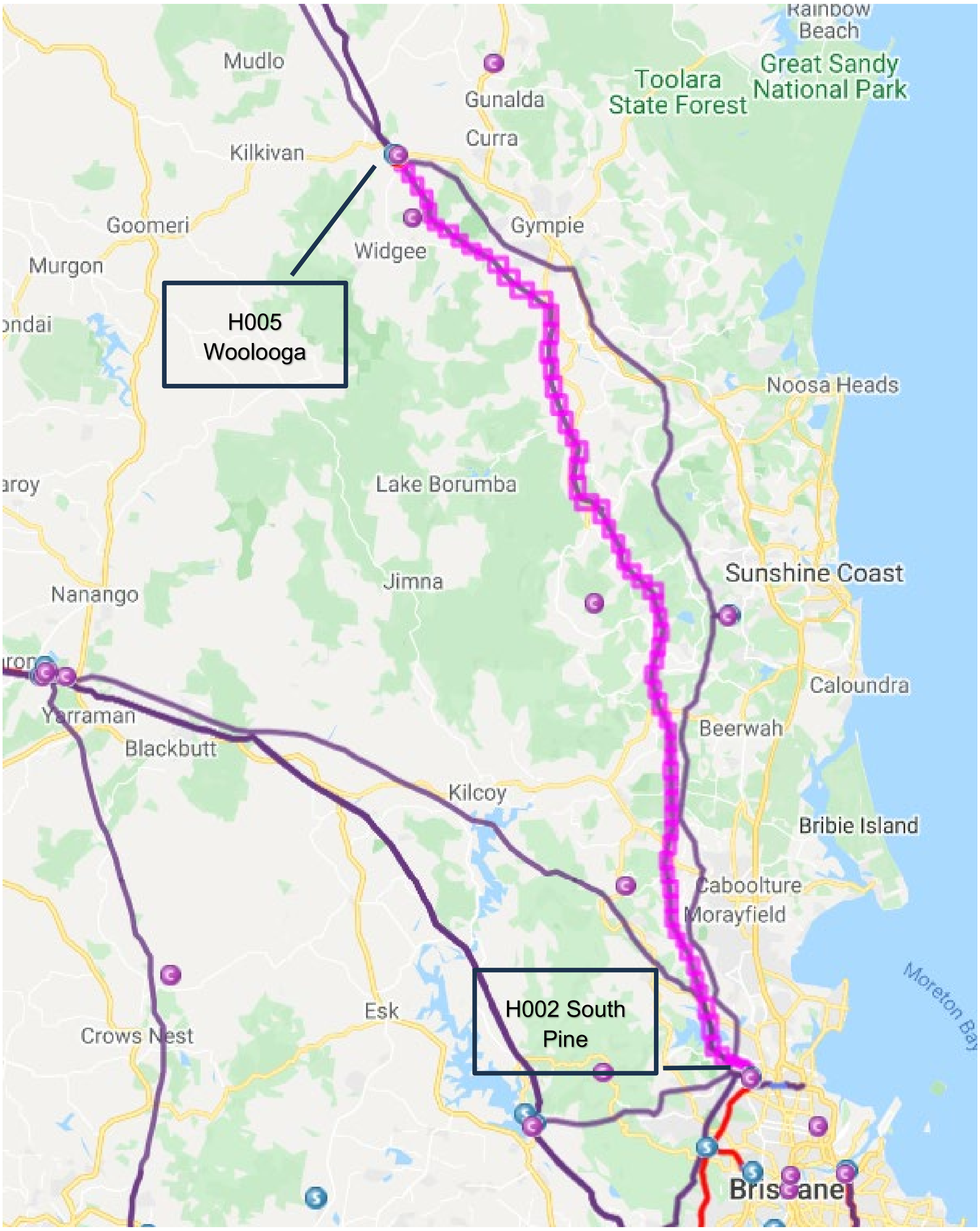


Figure 1: Overview of BS1020

1.1 Project Estimate

1.1.1 Option 1 - Refit of 254 structures by June 2032

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		122,932,093
TOTAL		**122,932,093**

1.1.2 Option 1 - Project Financial Year Cash Flows

DTS Cash Flow Table	Un-Escalated Cost ($)
To June 2027	152,112
To June 2028	2,097,637
To June 2029	608,448
To June 2030	2,510,952
To June 2031	77,468,703
To June 2032	40,080,740
To June 2033	13,501
TOTAL	**122,932,093**

1.1.3 Option 2 - Refit of 114 structures by June 2032

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		76,870,900
TOTAL		**76,870,900**

1.1.4 Option 2 - Project Financial Year Cash Flows

DTS Cash Flow Table	Un-Escalated Cost ($)
To June 2027	108,564
To June 2028	1,877,635
To June 2029	434,255
To June 2030	1,196,495
To June 2031	41,503,922
To June 2032	31,732,221
To June 2033	17,808
TOTAL	**76,870,900**

1.1.5 Option 3 – Staged Refit of 114 structures by June 2042

		Total ($)
Estimate Class	5	
Base Estimate – Un-Escalated (2025/2026)		81,898,896
TOTAL		**81,898,896**

1.1.6 Option 3 - Project Financial Year Cash Flows

DTS Cash Flow Table	Unescalated Cost ($) Option 3 - Stage 1	Unescalated Cost ($) Option 3 - Stage 2	Unescalated Cost ($) Option 3 - Stage 3	Total Unescalated Cost ($)
To June 2027	98,443	0	0	98,443
To June 2028	1,949,722	0	0	1,949,722
To June 2029	393,771	0	0	393,771
To June 2030	2,327,109	0	0	2,327,109
To June 2031	16,982,842	0	0	16,982,842
To June 2032	27,929,876	0	0	27,929,876
To June 2033	0	1,769,546	0	1,769,546
To June 2034	0	1,237,857	0	1,237,857
To June 2035	0	433,840	0	433,840
To June 2036	0	6,387,570	0	6,387,570
To June 2037	0	4,095,478	0	4,095,478
To June 2038	0	0	0	0
To June 2039	0	0	1,948,347	1,948,347
To June 2040	0	0	836,100	836,100
To June 2041	0	0	2,983,955	2,983,955
To June 2042	0	0	12,524,443	12,524,443
TOTAL	**49,681,761**	**13,924,290**	**18,292,845**	**81,898,896**

2. Project and Site-Specific Information

2.1 Project Dependencies & Interactions

This project is related to the following projects:

Project No.	Project Description	Planned Commissioning Date	Comment
Other Related Projects			
CP.02392	Woolooga 275, 132kV Secondary Systems Replacement	26 June 2029	May impact outage availability

2.2 Site Specific Issues

Issues specific to BS1020 are as follow:

- The transmission line is situated in the Southeast Queensland commencing at the Woolooga Substation northwest of Gympie and concludes at the South Pine Substation north of Brisbane City.
- The line traverses a wide range of topography from undulating grazing and agricultural land to hilly and very steep terrain Melany and Glass House Mountains regions.
- Land use on the easement varies from large grazing and agricultural properties, National Parks, State and private forestry plantations and residential estates.
- Maintenance of infrastructure within National Parks and state forests areas are subject to the Queensland Electricity Supply Industry (QESI) Maintenance Code.
- The region experiences extremes in climatic conditions including, high ambient temperatures, high relative humidity and regular rainfall outside of the wet season, and this coupled with the large travel times to some structures (up to two hours travel time) will require a high level of fatigue management for site-based personnel.
- Unexploded Ordnance (UXO) mapping indicates that the alignment may contain UXO with a risk rating of “Other” within the suburbs of Warner and Cashmere, North of the South Pine Substation.
- UXO inductions will be incorporated in the Project Management Plan and induction process. A UXO Management Plan may be required on sites where excavations are required such as the installation of structure earthing.
- The Gympie area is subject to the following average number of days of rain. Consideration was given to this when developing this project schedule.

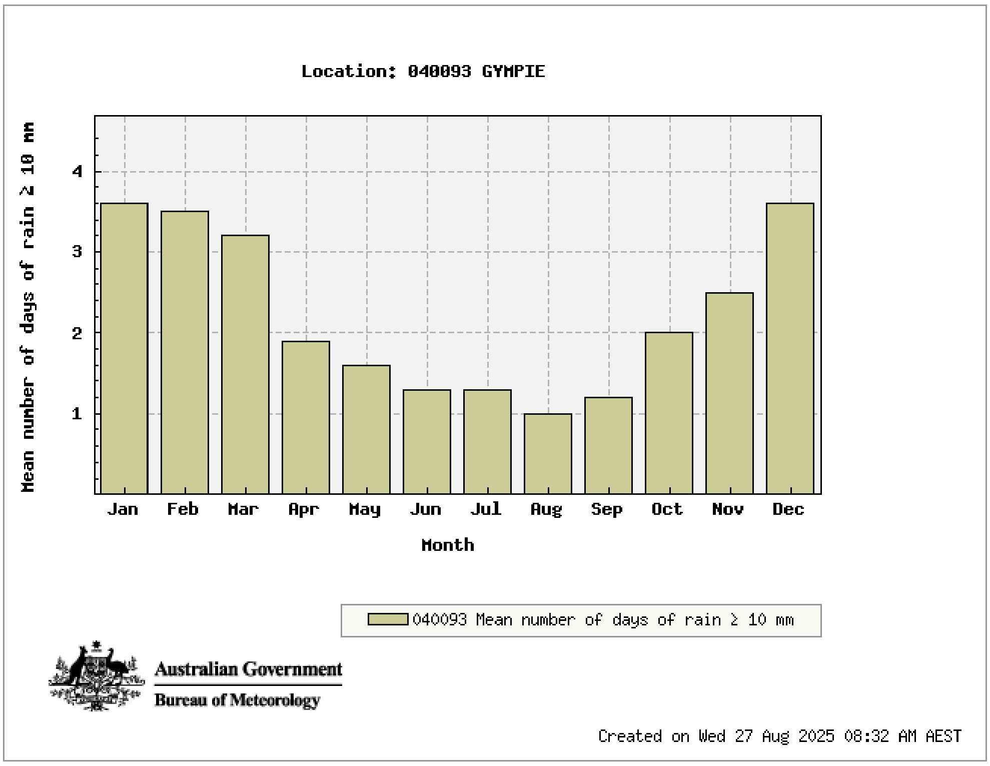


Figure 2: Number of Days of Rain >=10mm (Source: Bureau of Meteorology 27th of August 2025)

3. Project Scope

The project scope involves selective transmission line refit works to the structures on Built Section 1020, 275kV single circuit line between Powerlink's Sout Pine and Woolooga Substation to extend its service life by 15 years. The scope will also involve aspects of vegetation management, access track repair, biosecurity management, cultural heritage assessment, landholder relations, to enable the required refit works.

3.1 Major Scope Assumptions

It is assumed that:

- No substantial vegetation clearing or the establishment of new access tracks are required to complete the project scope of work.
- For estimating purposes, a nominated value has been used for upgrade to the existing access track network for each project option.
- The average tower has 2000 fasteners, 200 step bolts, and 600 members.
- The Pre Construction Line Asset Measuring Points (LAMP) works will be completed under SAHVEA (Safe Access to High Voltage Electrical Apparatus) conditions. To reduce the time Feeder 807 will be out of service during the LAMP, it is assumed the works will be completed by a Line Refit Panel Contractor utilising four (4) climbing crews.
- Line Refit works by a Line Refit Contractor and Over-head Earth Wire (OHEW) replacement, insulation and hardware replacement works by a Maintenance Service Partner (MSP) will be undertaken concurrently under the High Voltage Disconnection Permit (HVDP) with the removal of underslung bridging on a tension structure. This will considerably reduce the feeder outage durations.

3.2 Scope Exclusions

The below are excluded from the scope of works:

- The implementation of any actions or modifications to correct the climbing corridor restrictions on the S2S2 and S2S0 structures not identified by this project scope.
- Construction of new access tracks structures or the installation of crane pads at the towers.
- Property owner compensation costs.

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 – Refit of 254 structures by June 2032

The following works have been costed for in the estimate.

3.4.1 Transmission Line Works

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP. Note: LAMP works will require feeder 807 to be taken out of service to facilitate climbing of the towers.
- Review and upgrade access tracks to enable contractor access for works on the built section.
- For the purposes of the estimate, it is assumed that no climbing solution has been developed and therefore it is included to replace corrosion grade 3 and 4 step bolts (20% or 10160 step bolts and 10160 fall arrest brackets).
- Replacement of corroded Overhead Earth Wire (OHEW) from 1020-STR-4000 to 1020-STR-4005 (5 spans).
- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion (970 tension strings, 6 bridging strings and 2 restraint bridging strings require replacement).
- Replace tower members and fasteners with G3 corrosion and above. Assumed an average of approximately 20% of fasteners (101600) and 2% of members (3048) on 254 of the 358 structures.
- Repair foundation interfaces of affected structures (5% or 26 foundations).
- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings (15% or 39 structures).
- Repair/replace damaged anticlimbing barriers and faded signage on affected structures (25% or 64 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 – Refit of 114 structures by June 2032

The following works have been costed for in the estimate.

3.5.1 Transmission Line Works

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP. Note: LAMP works will require feeder 807 to be taken out of service to facilitate climbing of the towers.
- Review and upgrade access tracks to enable contractor access for works on the built section.
- For the purposes of the estimate, it is assumed that no climbing solution has been developed and therefore it is included to replace corrosion grade 3 and 4 step bolts (45% or 10260 step bolts and 10260 fall arrest brackets).
- Replacement of corroded Overhead Earth Wire (OHEW) from 1020-STR-4000 to 1020-STR-4005 (5 spans).
- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion (970 tension strings, 6 bridging strings and 2 restraint bridging strings require replacement).
- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above. Assumed an average of approximately 45% of fasteners (102600) and 2% of members (1368) on 114 of the 358 structures.
- Repair foundation interfaces of affected structures (5% or 12 foundations).
- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings (15% or 18 structures).
- Repair/replace damaged anticlimbing barriers and faded signage on affected structures (25% or 29 structures).
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

3.6 Option 3 – Staged Refit of 114 structures by June 2042

The following works have been costed for in the estimate.

3.6.1 Transmission Line Works

<u>Stage 1 by 2032 – 62 Structures</u>

- Perform a full LAMP and condition assessment of all structures to inform scope and provide measuring point data for input into SAP.
- Review and upgrade access tracks to enable contractor access for works on the built section.
- For the purposes of the estimate, it is assumed that no climbing solution has been developed and therefore it is included to replace corrosion grade 3 and 4 step bolts (50% or 6200 step bolts and 6200 fall arrest brackets).
- Replacement of corroded OHEW from 1020-STR-4000 to 1020-STR-4005 (5 spans).
- Replace remaining insulators original to the line and original hardware exhibiting G3 corrosion (970 tension strings, 6 bridging strings and 2 restraint bridging strings).
- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above. Assumed an average of approximately 50% of fasteners (62000) and 2% of members (744) on 62 of the 358 structures.
- Repair foundation interfaces of affected structures (5% or 7 foundations).
- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings (15% or 10 structures).
- Repair/replace damaged anticlimbing barriers and faded signage on affected structures (25% or 16 structures).

- 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 2037 – 15 Structures

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above. Assumed an average of approximately 40% of fasteners (12000) and 1% of members (90) on 15 of the 358 structures.
- Repair foundation interfaces of affected structures (5% or 2 foundations).
- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings (15% or 3 structures).
- Repair/replace damaged anticlimbing barriers and faded signage on affected structures (25% or 4 structures).
- Perform a LAMP and condition assessment of all affected structures on completion of works and provide measuring point data for input into SAP.

Stage 3 by 2042 – 37 Structures

- For all structures with a health index of 8 or above, replace tower members and fasteners with G3 corrosion and above. Assumed an average of approximately 40% of fasteners (29600) and 1% of members (222) on 37 of the 358 structures.
- Repair foundation interfaces of affected structures (5% or 4 foundations).
- Measure structure footing resistance of affected structures and review earthing against AS7000 classification, install grading rings (5% or 6 structures).
- Repair/replace damaged anticlimbing barriers and faded signage on affected structures (25% or 9 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 - Refit of 254 structures by June 2032

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	June 2027 – October 2027

Request for Class 3 Estimate	February 2028
Class 3 Project Proposal Submission	August 2028
RIT-T (assumed 9 months)	December 2028 – September 2029
ITT Submission (8 Weeks)	June 2029 – July 2029
Evaluate Tender, Reconcile Estimate and Submit PMP for Stage 2 Approval	October 2029 – November 2029
Stage 2 Approval (PAN2)	January 2030
Execute Delivery (including award of PATL contract)	January 2030 – June 2030
Line Refit Works and Construction	June 2030 – October 2031
MSP Site works (Insulator and hardware replacement)	April 2031 – October 2031
Project Commissioned	January 2032

4.1.2 Option 2 - Refit of 114 structures by June 2032

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	August 2027 – December 2027
Request for Class 3 Estimate	April 2028
Class 3 Project Proposal Submission	October 2028
RIT-T (assumed 9 months)	February 2029 – October 2029
ITT Submission (8 Weeks)	July 2029 – August 2029
Evaluate Tender, Reconcile Estimate and Submit PMP for Stage 2 Approval	September 2029 – October 2029
Stage 2 Approval (PAN2)	February 2030
Execute Delivery (including award of PATL contract)	February 2030 – July 2030
Line Refit Works and Construction	July 2030 – December 2031
MSP Site works (Insulator and hardware replacement)	April 2031 – October 2031
Project Commissioned	March 2032

4.1.3 Option 3 - Staged Refit of 114 Structures by June 2042

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	June 2027 – October 2027
Request for Class 3 Estimate	July 2028
Class 3 Project Proposal Submission	January 2029
RIT-T (assumed 9 months)	January 2029 – September 2029
ITT Submission (8 Weeks)	June 2029 – July 2029
Evaluate Tender, Reconcile Estimate and Submit PMP for Stage 2 Approval	October 2029 – November 2029
Stage 2 Approval (PAN2)	December 2029
Line Refit Contractor Site Establishment - Stage 1	April 2031
Line Refit Works and Construction – Stage 1	April 2031 – November 2031
MSP Site works (Insulator and hardware replacement) – Stage 1	June 2031 – October 2031
Line Refit Contractor Site Establishment - Stage 2	April 2037
Line Refit Works and Construction – Stage 2	April 2037 – August 2037
Line Refit Contractor Site Establishment - Stage 3	June 2041
Line Refit Works and Construction – Stage 3	June 2041 – November 2041
Project Commissioned	January 2042

4.2 Network Impacts

An outage on feeder 807 has the following network requirements and impacts.

- Network Requirements:
    - 275kV feeders 808 + 810 in service.
    - 275kV feeders 8810 + 8811 in service.
    - H002 South Pine to H009 Palmwoods to H005 Woolooga 110kV and 132kV networks intact.
    - 275kV feeders 832 + 827 + 875 + 8812 + 837 in service.
- If required to manage voltages or if MIC is binding (to manage overloading of feeders 748 and 747). Split 132kV and 110kV network:
    - 795/2 and 7189/2 (open T070 Cooroy CBs 7952 and 71892).

- 745/4 and 746/4 (open H009 Palmwoods CBs 4472 and 4482).

- Market impact:
    - Thermal
        - Avoid overloads on 748/2 or 747/2 for loss of 810.
    - Interconnector/Cutset Transfer Limits
        - Queensland Central to South transfer limit of 2000MW.
    - Voltage/Transient/Oscillatory Stability
        - CQ-SQ voltage stability limit, Offset = -80MW.
- Planning Outages:
    - Avoid scheduling outages in Summer past 15:00 hrs to minimise risk of LOR or impacts to the market from constraints managing post contingent overloading on parallel feeders (808 and 810).
    - Highest market impact from this outage is likely to occur when CQSQ southerly flow is at its highest. During high loads, outages may be unable to proceed if recall times >1 hour or recalled before 15:00 hrs if the network will not land satisfactory for the next contingency.
    - Outage may be restricted to summer guideline restrictions as defined by AEMO Guideline for Transmission Network Outage Planning.
- Customer impact:
    - No customer impacts.

4.3 Project Staging

Option 1 staging:

Stage	Description/Tasks
1	Feeder 807 Out of Service Line Refit contractor to complete LAMP MSP to replace OHEW South Pine Substation from 1020-STR-4000 to 1020-STR-4005 (5 spans).
2	Feeder 807 Out of Service Refit contractor to complete Structural refit works Refit contractor to complete blasting and painting works MSP Lines Crew • Tension Structures • Suspension Structures
3	Float Outage period in 2031

Option 2 staging:

Stage	Description/Tasks
1	Feeder 807 Out of Service Line Refit contractor to complete LAMP

	MSP to replace OHEW South Pine Substation from 1020-STR-4000 to 1020-STR-4005 (5 spans).
2	Feeder 807 Out of Service Refit contractor to complete Structural refit works Refit contractor to complete blasting and painting works MSP Lines Crew • Tension Structures • Suspension Structures
3	Float Outage period in 2031

Option 3 stage 1, by 2032:

Stage	Description/Tasks
1	Feeder 807 Out of Service Line Refit contractor to complete LAMP MSP to replace OHEW South Pine Substation from 1020-STR-4000 to 1020-STR-4005 (5 spans).
2	Feeder 807 Out of Service Refit contractor to complete Structural refit works Refit contractor to complete blasting and painting works MSP Lines Crew • Tension Structures • Suspension Structures
3	Float Outage period in 2031

Option 3 stage 2, by 2037:

Stage	Description/Tasks
1	Feeder 807 Out of Service Refit contractor to complete Structural refit works, including blast and paint
2	Float Outage period in 2036

Option 3 stage 3, by 2042:

Stage	Description/Tasks
1	Feeder 807 Out of Service Refit contractor to complete Structural refit works, including blast and paint
2	Float Outage period in 2041

4.4 Resourcing

This project will require the utilisation of both Refit Contractor and MSP resources during execution as per the proposed resourcing structure in Section 4.3.

Resource availability during the pending execution of this project is unknown, however, it is anticipated that sufficient resources shall be available to suit the project schedule.

5. Project Asset Classification

5.1 Option 1 - Refit of 254 structures by June 2032

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	0
Substation Secondary Systems	-	0
Telecommunications	-	0
Overhead Transmission Line	122,932,093	100
TOTAL	**122,932,093**	**100**

5.2 Option 2 - Refit of 114 structures by June 2032

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	0
Substation Secondary Systems	-	0
Telecommunications	-	0
Overhead Transmission Line	76,870,900	100
TOTAL	**76,870,900**	**100**

5.3 Option 3 – Staged Refit of 114 Structures by June 2042

Asset Class	Base ($)	Base (%)
Substation Primary Plant	-	0
Substation Secondary Systems	-	0
Telecommunications	-	0
Overhead Transmission Line	81,898,896	100
TOTAL	**81,898,896**	**100**

6. References

Document name and hyperlink	Version	Date
Project Scope Report	Rev 2	22/10/2025

Risk Cost Summary Report

CP.02818

BS1020 Woolooga – South Pine 275kV 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 Woolooga – South Pine 275kV transmission line (BS1020), which is proposed for a refit under CP.02818. 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 Woolooga to South Pine line, 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 BS1020 by a further 15 years.
- There is no network risk or market impact associated with BS1020.
- 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 / Market impact – Not Applicable for BS1020
- 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 $0.24 million in 2026 to $5.75 million by the end of the 2027-32 regulatory period. Key highlights of the analysis include:

- Safety risk is approximately 51% of the total base case risk cost for this built section.
- 38 % of the total base case risk is the financial risk associated with failure of the assets. Financial consequences include emergency restoration costs associated with the failure of structures, insulators or associated hardware in addition to 3rd party damage in special locations such as utility crossings.
- There is a low bushfire risk associated with the failure of assets on this built section.

Figure 1: Total Risk Cost

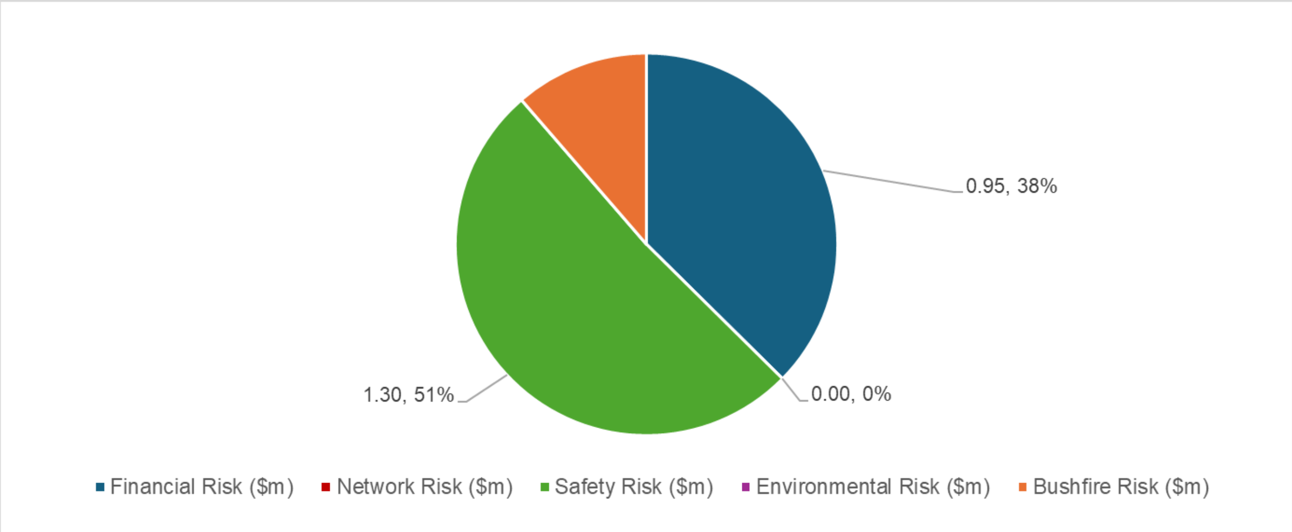


Figure 2: Base Case Risk Cost Contributions (2030)

Option Risk Cost

For modelling purposes, the refit of structures on BS1020 South Pine - Woolooga transmission line reduces effective HI scores to 4.8–5.7, depending on the corrosion region, which lowers both failure probability and risk cost. 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.

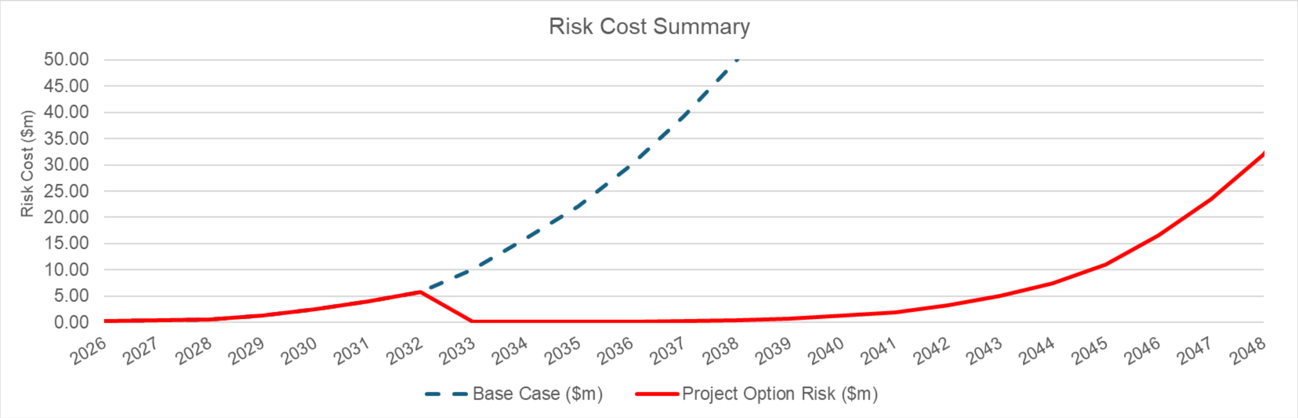


Figure 3: Project Option Risk Cost

Following the year of investment (2032) the risk cost associated with the equipment in scope effectively reduces to $0.11m. By 2048, the annualised risk cost of the project option is approximately $32 million, compared with the annualised base case risk cost of $306.79 million.

Further investment will be required to maintain the risk in future regulatory periods to achieve the 15-year life extension.

Cost Benefit Analysis

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

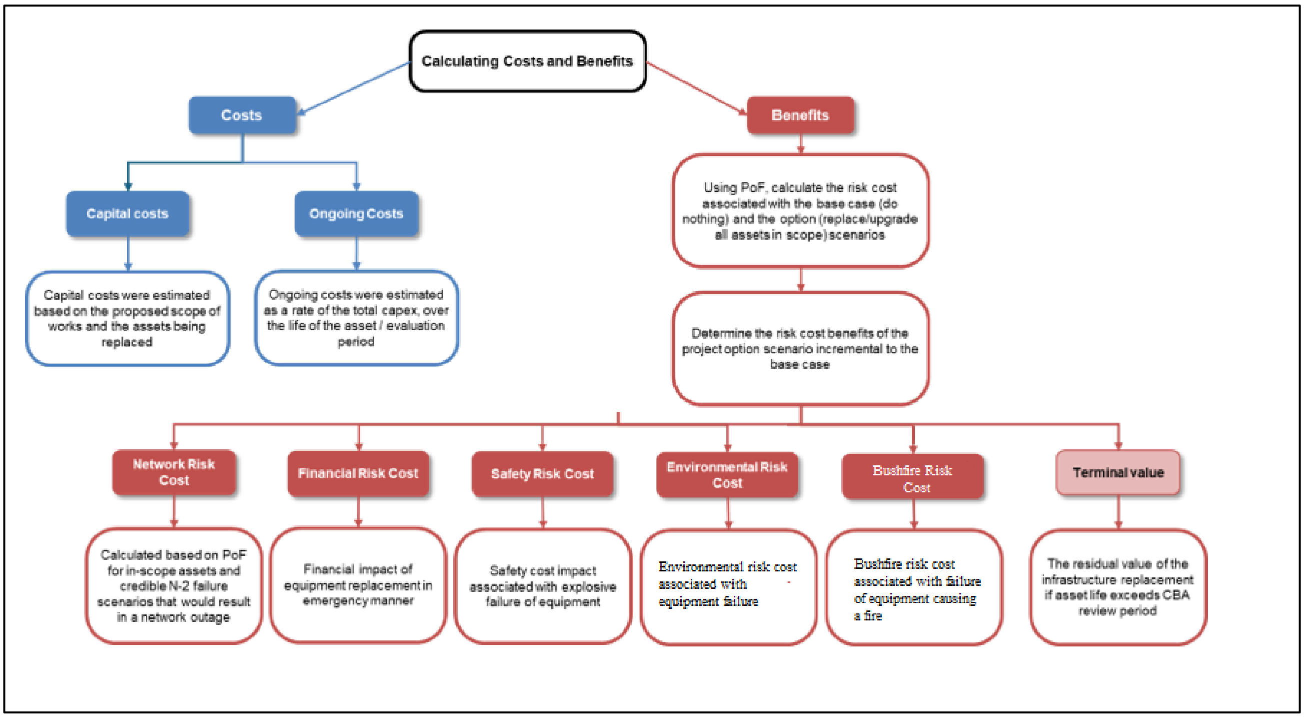


Figure 4: CBA Methodology

The project is estimated to cost approximately $49.678million. 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 $484.9 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	$995.3	$484.9	$289.7
Benefit-Cost Ratio	ratio	>10	>10	>10

Table 2: Net Present Value and Optimal Year of Investment

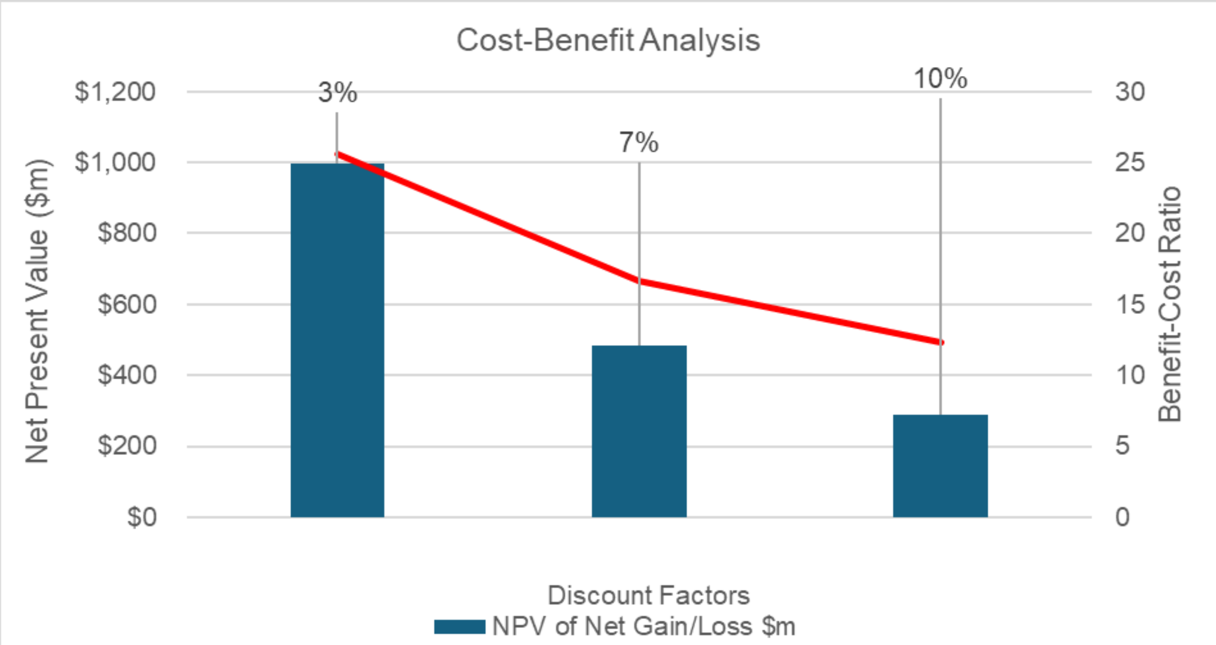


Figure 5: Cost Benefit summary

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 baseline Financial Cost of 3rd Party Damage cost of consequence** in the event of a tower collapse. Halving the cost of consequence results in a decrease in risk cost of $0.29 million, or approximately 11.35% of the original base risk.

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%	-$0.03	-1.27%
Main Road - Likelihood of Safety Incident	3.000%	1.500%	-$0.01	-0.20%
HV Distribution Lines - Likelihood of Safety Incident	2.000%	1.000%	-$0.05	-2.07%
LV Distribution Lines - Likelihood of Safety Incident	3.000%	1.5000%	$0.00	-0.13%
Houses in fall zone - Likelihood of Safety Incident	10.000%	5.000%	$0.00	-0.14%
Population none - Likelihood of Safety Incident	0.5%	0.25%	$0.00	-0.113%
Population 0_500 - Likelihood of Safety Incident	0.667%	0.333%	-$0.04	-1.41%
Population 500_2000 - Likelihood of Safety Incident	1.000%	0.500%	$0.00	0.00%
Cost consequence of multiple fatality	$11,400,000	$5,700,000	-$0.02	-0.81%
Cost consequence of single fatality	$5,700,000	$2,850,000	-$0.03	-1.22%
Cost consequence of multiple serious injury	$4,206,600	$2,103,300	-$0.05	-1.80%
Cost consequence of single serious injury	$2,103,300	$1,051,650	-$0.04	-1.50%
Financial				
Tower Collapse				
Emergency premium	20%	10%	-$0.01	-0.556%
Unit Cost (Tension)	$451,245	$225,622	-$0.05	-1.959%
Unit Cost (Suspension)	$428,683	$214,341	-$0.03	-1.376%
Local Road - Financial Cost of 3rd Party Damage	$900,000	$450,000	-$0.04	-1.523%
Main Road - Financial Cost of 3rd Party Damage	$1,500,000	$750,000	-$0.01	-0.264%
HV Distribution Lines – Fin. Cost of 3rd Party Damage	$60,000	$30,000	$0.00	-0.166%
LV Distribution Lines - Fin. Cost of 3rd Party Damage	$40,000	$20,000	$0.00	-0.005%
Houses in fall zone – Fin. Cost of 3rd Party Damage	$300,000	$150,000	$0.00	-0.011%
Population none - Financial Cost of 3rd Party Damage	$2,000,000	$1,000,000	-$0.03	-1.213%
Population 0_500 - Financial Cost of 3rd Party Damage	$2,000,000	$1,000,000	-$0.29	-11.350%
Population 500_2000 – Fin. Cost of 3rd Party Damage	$2,000,000	$1,000,000	$0.00	-0.017%

Table 3: Participation Factors