



Cosmo Howley Zone Substation Condition Assessment Report

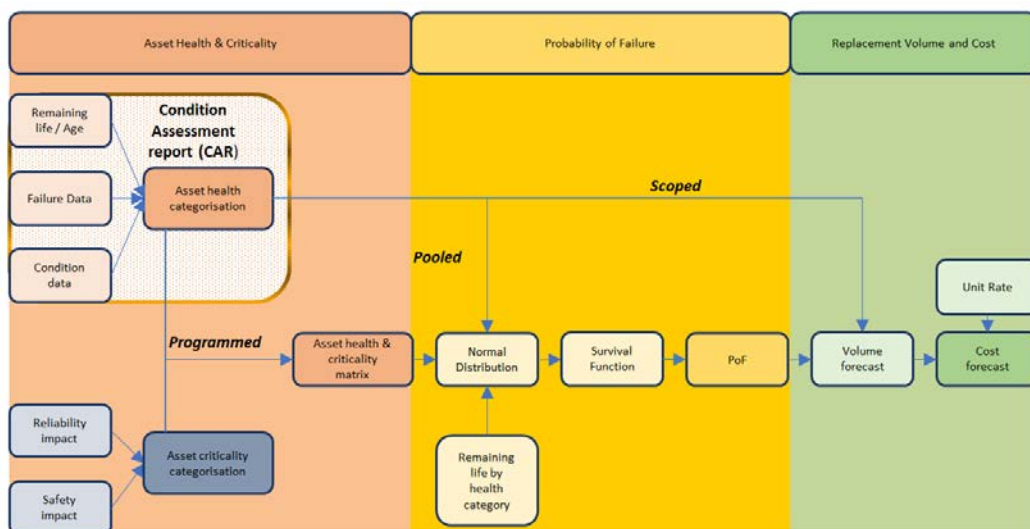
TABLE OF CONTENTS

- 1 Introduction..... 1
- 2 Summary..... 2
- 3 Single Line Diagram 4
- 4 Site Overview..... 4
- 5 Asset Condition Assessment..... 5

1 Introduction

This condition assessment report (CAR) provides a structured condition assessment of all the assets in a format aligned to the PWC asset hierarchy¹ and applying the condition assessment criteria² for each asset class within the Cosmo Howley substation. The CAR collates and summarises information from various PWC data sources that are either in raw data format or conditioned data and is traceable to the source. The following diagram illustrates where the CAR sits within the asset management process within PWC.

Figure 1 - Role of CAR in the PWC asset management process



¹ Refer to PWC document D2015/354287 Asset Data Template

² Refer to PWC document D2018/65161 for a complete description of the PWC condition assessment methodology.

Approved By:	Prepared By:	Issue Date: 22 February 2018	Status: Approved
Group Manager Asset Strategy	Condition Monitoring Engineer	Document No.: D2018/80517	Version No: 1.0

Cosmo Howley Substation Condition Assessment Report

The output of the CAR is an assessment of remaining serviceable life before some form of intervention is required for the asset to continue to provide the service it was designed for. The information within the CAR is used as an input to determine the most effective asset class management plan and by definition the CAR **does not include a criticality assessment.**

2 Summary

The following table and commentary provides a summary of the asset health at the Cosmo Howley substation. Table 1 describes the asset health definitions used in this CAR. A more detailed breakdown of the asset health components and scores can be found in section 5.

Table 1 - Asset health definitions

Code	Definition ³	Asset Health Rating range
	<i>Loss of required function within 5 years</i>	<i>2.34 - 3</i>
	<i>Loss of required function within 5-15 years</i>	<i>1.68 – 2.33</i>
	<i>New asset / minor degradation (remaining life beyond 15 years)</i>	<i>1 – 1.67</i>

³ Consistent with Asset health and criticality method D2018/72550

Cosmo Howley Substation Condition Assessment Report

Table 2 - Summary of asset health

Asset Class	Sub Asset	Asset Health Rating
Building structures	Overall	2
Civils / earthgrid	Overall	1
Protection	Overall	1
HV cable	Overall	N/A
ZSS TF's	Overall	N/A
	TF1	2.2
	TF2	2.2
11/22kV indoor switchboard	Overall	N/A
66kV CB's	Overall	N/A
	CB 66CH201	1
SCADA	Overall	1
Comms	Overall	1
Capacitor banks	Overall	N/A
Airconditioning	Overall	1
	Airconditioning	1
	Dehumidifier	N/A
66kV Isolators	Overall	1
66kV inst TF's	Overall	3
Fire systems	Overall	3
Aux TF	Overall	1
LV board	Overall	3
DC supplies	Overall	2
66kV busbar	Overall	3

The following additional commentary is provided to complement the above summary in relation to significant asset classes by exception.

ZSS Transformers

Both transformers are 56yrs old and are reaching end of their useful life; a design life of 50 years has been assumed.

Transformers 1 and 2 show high moisture levels in the main insulation system. This is supported by electrical insulation tests and oil quality results. This transformer has a history of ongoing oil leaks and corrosion; re-occurring leaks have been addressed over time but are costly to rectify. These leaks are likely to contribute to moisture issues with both transformers. The OLTC's for both transformers are no longer functional and are used as an off-load-tap-changer.

Transformers 1 & 2 have estimated DP values of 592 & 606 respectively using furan analysis of the oil samples. Given the age, operating conditions, historical oil filtering and oil quality, the DP is likely to be much lower. Power and Water's average fleet DP value for 45-a 55 year old transformer is 423. Based on extrapolated DP values and typical fleet degradation rates the DP value is likely to be a lot lower than the furan analysis suggests ~ 300-400.

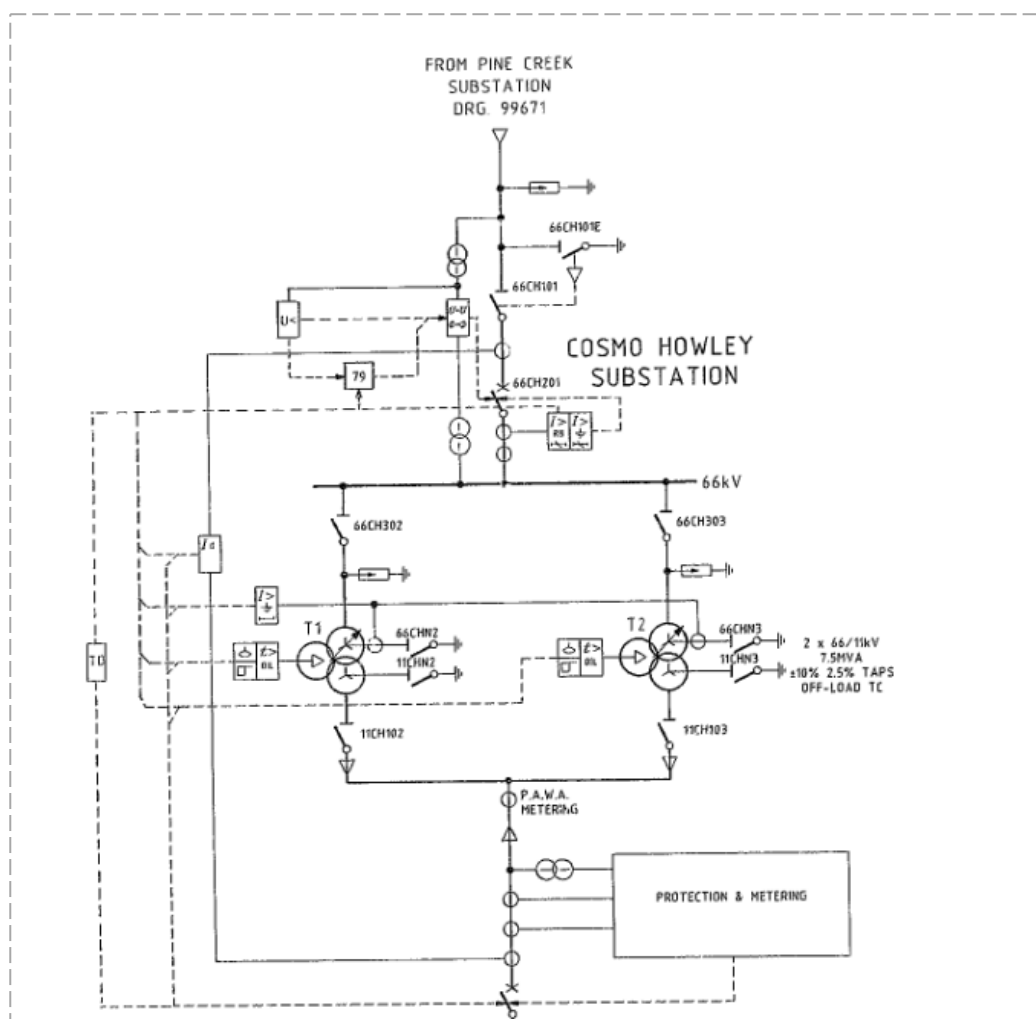
Cosmo Howley Substation Condition Assessment Report

Reduced tensile strength of the paper insulation compromises their ability to withstand system transients. It would be prudent to plan for end of life & manage exposure to fault risk for both transformers.

3 Site Overview

The Cosmo Howley Zone Substation is located on the south eastern corner of the Dorat Road and Ooloo Road intersection, approximately 5 km off the Stewart Highway and 45 km south east of Adelaide River. The substation is adjacent to the de-commissioned and demolished Cosmo Howley Power Station site. Cosmo Howley substation was established in 1970 and is at the end of a radial 66kV line supplied from the upstream 132kV Pine Creek substation. The substation is a 66/11 kV substation with two power transformers and associated switchgear and ancillary equipment. The substation currently supplies a single mining customer. Most of the substation contains the originally installed equipment.

4 Single Line Diagram



Cosmo Howley Substation Condition Assessment Report

5 Asset Condition Assessment

The following asset condition assessment is based on the current PWC condition assessment criteria for its various asset classes. The supporting test results and values where applicable have been extracted from relevant PWC asset databases and reports.

The three levels of asset health are characterised as follows.

Code	Definition ⁴	Asset Health Rating range
	Loss of required function within 5 years	2.34 - 3
	Loss of required function within 5-15 years	1.68 – 2.33
	New asset / minor degradation (remaining life beyond 15 years)	1 – 1.67

Asset Class	Sub Asset	Remaining serviceable life criteria	Asset Health Rating	Comments / Source
Building structures		Overall	2	
		Independent structural report / site inspection report	N/A	No significant issues.
		Asbestos rating	2	The building contains asbestos but is managed.
		Age	2	This is the original building established in 1970 so will be 50 years old in the RY2020-24 regulatory period.
Civils / earthgrid		Overall	1	
		Earthgrid test results	1	D2015/1905 FortEng Earthing Report.
		Assessment of switchyard	1	
Protection		Overall	1	Replacement in current financial year
		Technology type	1	
		Relay calibration	1	
		Failure rate		Future measure

⁴ Consistent with Asset health and criticality method D2018/72550

Approved By:	Prepared By:	Issue Date:22 February 2018	Status: Approved
Group Manager Asset Strategy	Condition Monitoring Engineer	Document No.: D2018/80517	Version No: 1.0

Cosmo Howley Substation Condition Assessment Report

Asset Class	Sub Asset	Remaining serviceable life criteria	Asset Health Rating	Comments / Source
HV cable		Overall	N/A	
		Construction technology / design / installation		
ZSS TF's		Overall	N/A	
	TF1	Overall	2.2	
		Degree of polymerisation	2	Ref: D2017/153127 Cosmo Howley Transformer CAR
		Oil Analysis	1	Output from 'TxAnalyser' platform
		Age	3	
	TF2	Overall	2.2	
		Degree of polymerisation	2	Ref: D2017/153127 Cosmo Howley Transformer CAR
		Oil Analysis	1	Output from 'TxAnalyser' platform
		Age	3	
11/22kV indoor switchboard		Overall	N/A	
66kV CB's		Overall	N/A	
	CB 66CH201	Overall	1	These circuit breakers are scheduled for replacement this financial year so has been given a final H1 score.
		Age	1	
		Condition Assessment	1	
		Defect count	1	
		Defect cost	1	
		Insulation technology	1	
		Mechanism technology	1	
SCADA		Overall	1	New installation in current financial year
		Age	1	
		Failure rate		Future measure

Cosmo Howley Substation Condition Assessment Report

Asset Class	Sub Asset	Remaining serviceable life criteria	Asset Health Rating	Comments / Source
Comms		Overall	1	New installation in current financial year
		Age	1	
		Failure rate		Future measure
Capacitor banks		Overall	N/A	
		Age		
Airconditioning		Overall	1	2014 – D2013/288593
	Airconditioning	Age	1	
	Dehumidifier	Age	N/A	
66kV Isolators		Overall	1	1995 – D2017/230246
		Age	1	
66kV inst TF's		Overall	3	1976 – D2017/230246
		Age	3	
		Condition Assessment	N/A	
Fire systems		Overall	3	
		Defect cost		Future measure
		Age/Functionality/obsolescence	3	U/S no longer in use.
Aux TF		Overall	1	FAT report D2013/666429
		Age	1	Original units since 1981.
LV board		Overall	3	Original board
		Age	3	
DC supplies		Overall	2	Replaced in 2012
		Age	2	
66kV busbar		Overall	3	Original bus
		Age	3	