2023-27 POWERLINK QUEENSLAND REVENUE PROPOSAL

Project Pack - PUBLIC

CP.02392 Woolooga Secondary Systems Replacement

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CP.02392 - Woolooga Secondary System Replacement

Project Status: Not Approved

1. Network Requirement

The 275/132kV Woolooga Substation, approx. 165km north-west of Brisbane, was established in 1973 and supplies Energy Queensland loads in the Wide Bay area and supports Central to South Queensland (CQSQ) power transfers. The substation includes an adjacent Static VAR Compensator (SVC) yard, commissioned in 2008 to provide reactive power support for the CQSQ transfer. An outage of this asset would put up to 250MW of power and up to 3,800MWh of energy per day at risk².

A Condition Assessment (CA) carried out in March 2020 identified that most secondary system assets will reach the end of their technical service lives by 2029¹. The equipment is, or is becoming, obsolete with no support from the manufacturer and limited spares available. Beyond their 20 year nominal service life, secondary systems suffer increased failure rates. Increasing failure rates, along with the increased time to rectify the faults due to equipment obsolescence, significantly affects the availability and reliability of these systems. There is therefore a need for Powerlink to address this emerging risk to ensure ongoing compliance with Schedule 5.1 of the National Electricity Rules (NER) to ensure customers continue to receive safe, reliable and cost effective electricity services.

Energy Queensland forecasts confirm there is an enduring need to maintain electricity supply to the Wide Bay area. The removal or reconfiguration of the Woolooga Substation due to secondary system failure or obsolescence would violate Powerlink's Transmission Authority reliability obligations (N-1-50MW up to a maximum unsupplied load of 600MWh) and significantly impact the power transfer capability between Central and South Queensland. Failure to address the obsolescence of this asset is likely to result in non-compliance with Powerlink's reliability and system security obligations⁶.

2. Recommended Option

As this project is currently 'Not Approved', project need and options will be subjected to the public Regulatory Investment Test for Transmission (RIT-T) consultation process to identify the preferred option closer to the time of investment.

The current recommended option is to replace all 275kV and 132kV secondary systems at Woolooga Substation by 2029².

The following options were considered but not proposed:

- Do Nothing rejected due to non-compliance with reliability standards.
- Non-Network Option parameters identified at present no viable non-network option has been identified.

Figure 2-1 shows the current recommended option reduces the forecast risk monetisation profile of the Woolooga Substation secondary systems by ~\$1.3m per annum. The recommended option will extend the asset life by 20 years.

Where a 'Do Nothing' scenario is adopted, the forecast level of risk associated with the asset rapidly escalates from approximately \$90k per annum in 2029 to an estimated \$1.3m per annum in 2030 and continues to rise each year thereafter. The significant increase in risk cost in 2030 coincides with the depletion of available spares, which result in financial risks to replace the failed secondary systems in an unplanned (emergency) manner and network risks (unserved energy) from concurrent network outages due to equipment failures.³

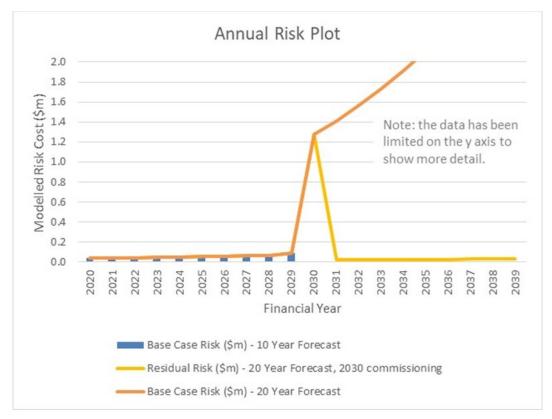


Figure 2-1 Annual Risk Monetisation Profile (Nominal)

3. Cost and Timing

The estimated cost to replace the 275/132kV secondary systems at Woolooga Substation is \$26.8m (\$2024/25 Base)⁵.

Target Commissioning Date: October 2029

4. Documents in CP.02392 Project Pack

Public Documents

- Secondary Systems Condition Assessment Report H005 Woolooga 275kV SVC, 132/275kV Substation
- 2. CP.02392 H005 Woolooga Secondary Systems Replacement Planning Statement
- 3. Risk Cost Summary Report CP.02392 Woolooga Substation Secondary Systems Replacement
- 4. Project Scope Report CP.02392 Woolooga 275/132kV Secondary System Replacement
- 5. Concept Estimate for CP.02392 Woolooga 275/132kV Secondary Systems Replacement

Supporting Documents

- 6. Asset Reinvestment Criteria Framework
- 7. Asset Management Plan 2021





H005 Woolooga 275kV SVC 132/275kV Substation

Secondary Systems Condition Assessment Report

	Docu	ment Details	
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Table of *Contents*

1.	Int	roduc	ction	3
2.	Inc	lusio	ns and Exclusions	7
2	.1	Inclu	usions	7
2	.2	Excl	usions	7
3.	Со	nditio	on Assessment Principles and Methodology	8
4.	Bu	ilding	ys	9
4	.1	Subs	station Secondary Systems Buildings	9
4	.2	SVC	Control Building	9
5.	Co	nditio	on Assessment	.11
5	.1	Sec	ondary System Outdoor Marshalling Kiosks	.11
5	.2	Outo	door Secondary System Cables	.16
5	.3	Indo	or Termination Racks / Yard Interface Cubicle	.17
5	.4	Indo	or Secondary System Cables	.17
5	.5	Con	trol and Protection Systems	.17
	5.5	5.1	Secondary Systems Panels	.17
	5.5	5.2	Control, Protection, Auxiliary, Ancillary, Metering and OpsWAN Equipment.	.22
	5.5	5.2.1.	Control, Protection, Auxiliary, Ancillary Equipment	.22
	5.5	5.2.2.	Revenue Metering Panels	.24
	5.5	5.2.3.	Revenue Metering Equipment	.24
	5.5	.2.4.	OpsWAN System Panels	.24
	5.5	5.2.5.	OpsWAN Equipment	.25
	5.5	5.3	Auxiliary Supply	.26
	5.5	5.3.1.	AC Auxiliary Supply	.26
	5.5	5.3.2.	DC Batteries and Chargers	.26
6.	Co	nclus	sion	.28
7.	Att	tachm	nents	.28
8.	Re	feren	ces	.29
9.	Αp	pend	ix A	.30

1. Introduction

H005 Woolooga Substation, including SVC yard, is a significant transmission substation located approximately 165km north-west of Brisbane. It was established in 1973 to assist with CQSQ power transfer. The substation is comprised of two switchyards:

- 1. The 275kV switchyard, which has feeders connecting to Gin Gin, South Pine, Palmwoods and Teebar Creek.
- 2. The 132kV switchyard, which provides 3 X 132 kV connections to Ergon and 2 X 132 kV connections to Energex for supply to Wide Bay, Gympie and North Coast Regions.

The SVC located adjacent to the substation, commissioned in in 2008, provides reactive power support for the CQSQ transfer.

The focus of the report is to assess the condition of secondary systems assets and to recommend the optimal reinvestment timing for these assets based on expected remaining technical life, performance and obsolescence. Recommendations have been derived from the condition assessment of secondary systems assets and associated equipment. Considerations for network reconfigurations, network enduring needs, engineering solutions, refurbishment options and implementation methodologies are not in scope of this report. As shown in Table 1 and Table 2 below, Woolooga Substation and SVC primary equipment bays include:



Table 1 – Woolooga Substation Network Elements

Lo			Woolooga SV		Remote
		` `			Substation
	Voltage	Quantity	Bay	Operational	
	(kV)		Designation	Element	
Feeders	275	6	=C01-Q20, -	813/2	Calliope River
			Q30		Tee Gin Gin
			=C02-Q10, - Q30	807	South Pine
			=C02-Q20, -	814/2	Calliope River
			Q30		Tee Gin Gin
			=C03-Q10, - Q30	810	Palmwoods
			=C03-Q20, -	8850	Teebar Creek
			Q30		
			=C07-Q10, -	584 (SVC)	
			Q30		1.5111.1
	132	5	=D02-Q10	764	Kilkivan
			=D03-Q10	765	Kilkivan
			=D14-Q10	7190	Mungar
			=D18-Q10	748/2	Cooroy Tee Gympie
			=D19-Q10	747/2	Traverstone
					Tee Gympie
Capacitor	275	1	=C06-Q10	Cap 1	
Banks	132	2	=D11-Q10	Cap 2	
			=D12-Q10	Cap 3	
Reactors		3			
Transformers	275	3	=C07-Q20, - Q30	3 Transf	
			=C07-Q10, -	4 Transf	
			Q30	(SVC =M04)	
			=C04-Q20, - Q30	5 Transf	
	132	2	=D17-Q10	3 Transf	
			=D04-Q10	5 Transf	
Busbars	275	2	=KC1	1 Bus	
			=KC2	2 Bus	
	422	2	=KD1	1 Bus	
	132	2	=KD2	2 Bus	

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20



Table 2 - Woolooga SVC Network Elements

			3 V C NELWORK L		
Loc	al Substat	tion (H005 \	Woolooga SVC	:)	Remote
					Substation
	Voltage	Quantity	Bay	Operational	
	(kV)		Designation	Element	
Transformer	18.0/	1	=C07-Q10, -	4 Transf	
	275 kV		Q30	(SVC =M04)	
Reactors	18.0	1	TCR1	TCR 1	
Capacitor	18.0	5	TSC1	TSC 1	
Banks			TSC2	TSC 2	
			HF5	5 th Filter	
			HF7	7 th Filter	
			HF11	11 th Filter	
Busbars	18.0	1		SVC LV Bus	



Figure 1 – 132kV/275kV Woolooga Substation and SVC Aerial View

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20



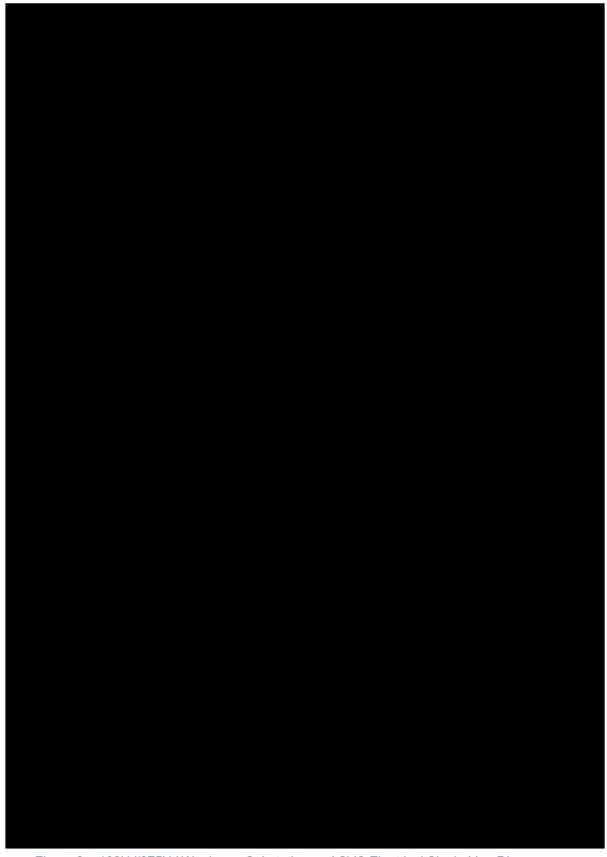


Figure 2 – 132kV/275kV Woolooga Substation and SVC Electrical Single Line Diagram

2. Inclusions and Exclusions

2.1 Inclusions

Secondary system assets and equipment provide monitoring, supervision, control and protection functions. The condition assessment of the following systems and equipment will be covered in this report.

- Secondary system cables All cables that are associated with secondary systems and equipment, including:
 - o Cables between control and protection panels and termination racks,
 - o Cables between termination racks and yard marshalling kiosks, AC and DC kiosks.
- OpsWAN panels, system and equipment,
- Secondary system AC and DC supply Low voltage (LV) AC Panel heaters and lights, DC batteries and chargers,
- Secondary system panels and associated ancillary parts, including links, terminals, Input / Output modules, signal converters, transducers and power supplies.
- Indoor and outdoor secondary systems marshalling kiosks, AC and DC kiosks, Termination racks, including internal links, terminals, MCBs and fuses,
- Indoor and outdoor control cables to outdoor secondary systems kiosks or cables from indoor secondary systems panels directly connected to primary equipment control kiosks.
- Secondary system equipment and systems, including protection relays, HMI computers, RTUs, data acquisition units, Programmable Logic Controllers (PLCs), Intelligent Electronic Devices (IED).
- Available space in existing control buildings to accommodate new secondary system panels.

2.2 Exclusions

The condition assessment of the following assets are not in scope of this report:

- Condition of control buildings and associated light and power circuits,
- Civil structures, cable trenches and foundations,
- ➤ AC auxiliary supply systems (> 230VAC), including transformers, diesel generators and building power and light circuits,
- Substation flood lights,
- Primary equipment and associated components e.g. transformer and circuit breaker control cubicles,
- Primary equipment kiosks and associated components, e.g. Power transformer, circuit breaker control kiosks. PLCs and Intelligent Electronic Devices (IED), regardless of their installed location (could be in transformer and circuit breaker control kiosks) are considered as secondary systems equipment.
- Cables from secondary systems outdoor kiosks (e.g. bay marshalling kiosks) to primary plant control kiosks.
- > Cables from primary plant control kiosks to primary plant equipment,
- Telecommunication assets, including 50VDC batteries and chargers.

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20

3. Condition Assessment Principles and Methodology

Principles of secondary systems condition assessment were based on Powerlink's Secondary Systems Asset Risk Model developed in [1], and "Powerlink – Asset Risk Management – Framework" in [2]. The methodology consists of two main parts – Desktop assessment based on [1, 2] and site visual inspection.

The desktop assessment is limited only to assets recorded in SAP asset database, e.g. protection relays, RTUs and IEDs. It is important to note that a significant number of secondary systems equipment, including cables, kiosks, terminals, links, panels, termination racks, auxiliary equipment and some IEDs are not recorded in SAP. The condition assessment of these depends solely on the site visual inspection. Site visual inspection also provides moderation and manual update of desktop assessments to reflect the actual condition of operational equipment at site.

The desktop assessment models the equipment health indices based on the optimisation of risk, cost and performance of Powerlink's secondary assets since 1999. The health index is the key condition measurement for each equipment in service. The model takes into account equipment failure rates calculated based on operational data, environmental conditions where the equipment is installed and the mean physical ages of a group of equipment at bay and system (fleet) levels.

Health indices are modelled in the range from zero (0) to ten (10), where zero represents newly installed equipment and ten indicates equipment that have reached the end of their technical service life. Equipment with a health index close to ten represents only a moderate increased risk of functional failures, but significantly longer outage duration and higher risk of impacting system's availability and reliability due to the lack of manufacturer support and available spares.

The key outcome of this report is the recommended replacement timing for secondary systems assets and equipment detailed in the Appendix section based on their health indices and condition assessment data.



4. Buildings

4.1 Substation Secondary Systems Buildings

The substation secondary systems are housed in two (2) demountable control buildings, building +2 and building +3, except a small quantity of OpsWAN equipment are still housed in the communication equipment room in building +1. All buildings associated with the substation are located within the substation perimeter fence, including the work shed.

4.2 SVC Control Building

The SVC building (+4) is located within the SVC perimeter fence, which is built on a separate platform adjacent to the substation. It houses control and protection panels, OpsWAN, thyristor valves, cooling system, 125V DC battery and charger, analogue and digital interface panels, control cables and associated auxiliary equipment. This building has some spare capacity to accommodate additional secondary system panels if required.

Details of substation and SVC buildings are shown in Table 3.

Table 3 - Woolooga Substation and SVC Buildings

Building Description	Designation	Functional Use	Spare Sec Sys
			Panel Spaces
Old Control Building +1	+1	Comms equipment, amenities	Old control room is completely empty (Approx. 30+ spare panel spaces)
Substation Secondary	+2 (275kV)	Sec Sys Bus =KC1, =KC2	5
System Building +2		Sec Sys Bays =C01, =C02, =C03, =C04, =C05, =C06, =C07	
Substation Secondary	+3 (132kV)	Sec Sys Bus =KD1, =KD2	8
System Building +3		Sec Sys Bays =D02, =D03, =D04, =D05, =D11, =D12, =D14, =D17, =D18, =D19	
		Revenue Metering	
		Power Quality Monitoring	
=M04 SVC Building +4	+4	SVC Sec Sys, Thyristor Valves and Valve Cooling	Spare capacity not measured
Work shed	+5	Maintenance Workshop	N/A

















(b) 275kV Demountable Control Building +2







(c) 132kV Demountable Control Building +3





(d) SVC Building +4

Figure 3 – H005 275/132kV Woolooga Substation secondary systems and SVC Buildings

5. Condition Assessment

5.1 Secondary System Outdoor Marshalling Kiosks

Woolooga substation and SVC marshalling kiosks were installed between 2008 and 2010. The kiosks are still in serviceable condition and should last until 2043/44. However, their internal components such as links, terminals and MCBs have already shown signs of deterioration due to harsh environmental conditions. In particular, some door seals and air filters, which appear to be made from low quality materials, have significantly degraded and should be replaced as part of routine maintenance. It is recommended that all outdoor marshalling kiosks be monitored as part of the substation routine inspection to identify any aggressive deterioration. An operational project (or maintenance work order) should be initiated to replace the internal components if they deteriorate beyond Powerlink's safety standards.

Health Indices of secondary system outdoor marshalling kiosks and recommended replacement timeframe have been detailed in <u>Appendix A</u>. Physical appearance of typical outdoor marshalling kiosks and air filters are illustrated below:

- Bay Marshalling Kiosks: in Figure 4;
- AC/DC Marshalling Kiosks: in Figure 5;
- Air Filters: in Figure 6.









(a) =D03-A10 Bay Marshalling Kiosk







(b) =D11-A10 Bay Marshalling Kiosk







(c) =D18-A10 Bay Marshalling Kiosk





Figure 4 – Physical appearance of typical outdoor bay marshalling kiosks at Woolooga substation











(b) =D07-A92 Bay DC Marshalling Kiosk





(c) =D15-A91 Bay AC Marshalling Kiosk

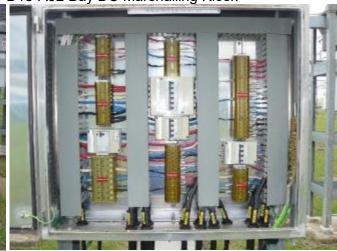




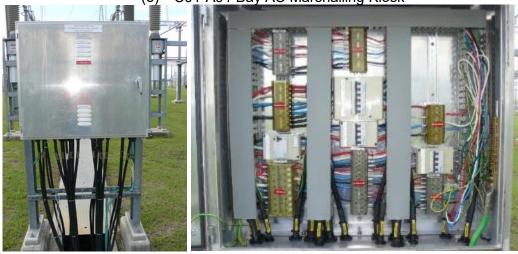


(d) =D15-A92 Bay DC Marshalling Kiosk





(e) =C01-A91 Bay AC Marshalling Kiosk



(f) =C04-A91 Bay AC Marshalling Kiosk





(g) =C04-A92 Bay DC Marshalling Kiosk

Figure 5 – Physical appearance of typical outdoor AC/DC marshalling kiosks at Woolooga substation



Figure 6 – Physical appearance of typical outdoor marshalling kiosks air filters at Woolooga substation



5.2 Outdoor Secondary System Cables

Outdoor secondary system cables are still in good condition as shown in Figure 7. Visual inspection of these cables indicated that they can be kept in service until 2043/44.



Figure 7 – Physical appearance of typical outdoor secondary system cables

5.3 Indoor Termination Racks / Yard Interface Cubicle

There is no building termination racks at Woolooga substation. Secondary system cables were installed directly between the indoor panels and outdoor marshalling kiosks. Therefore, new external termination racks may need to be installed external to the existing building to facilitate the secondary system replacement projects.

5.4 Indoor Secondary System Cables

All cables inside the control buildings are in good condition as they have been in a clean and air-conditioned environment since being installed around 2008/09. The replacement of indoor cables is deemed unnecessary until 2043/44.

5.5 Control and Protection Systems

Condition assessment of Woolooga Substation and SVC control and protection systems, including cubicles, equipment, internal components such as links, terminals, wirings, MCBs, fuses, cables is summarised in the **Appendix A**.

5.5.1 Secondary Systems Panels

All secondary systems panels, including auxiliary parts e.g. links, terminals and internal wiring were installed between 2008 – 2011, excluding Power Monitoring which was installed in 2014, and are currently still in good condition. They are suitable for service until 2028/29.











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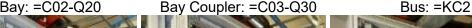


Power Quality Monitoring

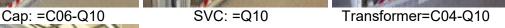
Figure 8 – Typical Indoor 132kV Secondary Systems Panels at Woolooga Substation













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Figure 9 – Typical Indoor 275kV Secondary Systems Panels at Woolooga Substation





SVC X Protection Panels



SVC 400V AC Auxiliary / Changeover Panel



HMI Human Machine Interface





SVC Control



SVC Interface

Valve Control

Figure 10 –Typical SVC Indoor Control and Protection Panels at Woolooga SVC



Figure 11 – SVC Cooling Control System Panel

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20



5.5.2 Control, Protection, Auxiliary, Ancillary, Metering and OpsWAN Equipment

5.5.2.1. Control, Protection, Auxiliary, Ancillary Equipment

Woolooga Substation and SVC secondary system comprises mostly microprocessor based control and protection equipment. There is a small number of solid state and modern electro-mechanical relays being used e.g. CB Fail Bus Trip relays, high impedance bus zone relays and SVC Multi-trip relays. Health indices and recommended replacement timeframe for substation and SVC secondary system equipment and associated ancillary equipment are tabled in the Appendix A.







Figure 12 – Woolooga Substation Typical Indoor Secondary System Equipment (2008 - 2010)



Figure 13 – Woolooga SVC Typical SVC Indoor Secondary System Equipment (2008)



5.5.2.2. Revenue Metering Panels

Woolooga Substation revenue-metering panels, including auxiliary parts e.g. links, terminals and internal wiring were installed in 2009 and currently still in good condition. They are suitable for service until 2029/30.



Figure 14 – Revenue Metering Panel

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20



5.5.2.3. Revenue Metering Equipment

Woolooga Substation and SVC's metering equipment were installed in 2009. They are suitable for service until 2029/30.



Figure 15 – Woolooga Substation and SVC Metering Equipment

5.5.2.4. OpsWAN System Panels

OpsWAN systems and equipment at this site were installed between 2007-2009. OpsWAN systems are still functioning and have an important role in operation and maintenance efficiencies. They are considered as auxiliary components of the power system. Their condition and performance generally do not have material impacts on the performance, reliability and availability of secondary systems and the power system.

Indoor OpsWAN systems and equipment should be replaced as part of the secondary systems replacement project. OpsWAN cameras (outdoor OpsWAN equipment) should only be replaced under corrective maintenance when they fail and shall be excluded from secondary system replacement projects.



+1 Master OpsWAN



+2 OpsWAN, LCF and NSCs



+3 OpsWAN, LCF and NSCs





+4 SVC OpsWAN LCF and NSCs

Figure 16 - Woolooga Substation and SVC OpsWAN Panel

5.5.2.5. OpsWAN Equipment

Woolooga Substation and SVC's OpsWAN equipment were installed between 2007 and 2009. They should only be replaced as part of the SVC secondary system replacement project, anticipated in 2028.



Figure 17 – Woolooga Substation and SVC OpsWAN Equipment

5.5.3 Auxiliary Supply

5.5.3.1. AC Auxiliary Supply

AC auxiliary supplies, including station transformers and backup diesel generator/s are not in scope of this report. AC heaters and lights servicing secondary system panels should only be replaced as part of the secondary systems panels, recommended in 2029.

5.5.3.2. DC Batteries and Chargers

Woolooga Substation and SVC have three (3) sets of 125VDC X and Y batteries and associated chargers installed between 2008 and 2010 as detailed in the Appendix A. Generally, there is one



set of duplicated batteries and chargers per secondary system building. According to the requirements of secondary systems and telecoms asset strategies, substation DC batteries' lifespan are now set at 12 years and chargers' lifespan would be set at 20 years. Therefore, all batteries at Woolooga Substation and SVC should be replaced by 2020/21. Battery monitors and chargers should be replaced around 20-year cycle.









(Buildings +3 Chargers – 2009)

 Objective ID:
 A3338686
 Version No:
 1.0
 Issue Date: 20/03/20





(Buildings +4 - SVC 125V X and Y DC Batteries and Chargers - 2008)

Figure 18 – Woolooga Substation and SVC 125VDC Batteries and Chargers

6. Conclusion

This report details the condition of Woolooga Substation and SVC secondary systems and equipment. The primary objective of the replacement is to maintain the current network reliability and availability and to minimise operational and compliance risks associated with secondary systems assets at Woolooga Substation and SVC. Health indices and replacement timeframe have also been recommended in Appendix A for the recommended replacement timing of:

- Chassis of Control and Protection Panels
- Secondary System Equipment, including batteries and charger
- Secondary System Cables
- Outdoor Marshalling Kiosks

Door seals and air filters of outdoor marshalling kiosks should be replaced as part of routine maintenance.

7. Attachments

• <u>Appendix A</u> – H005 110/275kV Woolooga Substation and SVC Secondary Systems Equipment Health Indices and Recommended Asset Placement Replacement Timeframe.



8. References

- [1] "Modelling Substation control and Protection Asset Condition for Optimal reinvestment Decision Based on Risk, Cost and Performance", CIGRE PARIS 26-31 August 2018, T Vu, M. Pelevin, D. Gibbs, J.Horan, C. Zhang.
- [2] "Powerlink Asset Risk Management Framework", ASM-I&P-FRA-A2417558, Powerlink Queensland, 2019.



Appendix A

	(a): Subject to Fowerlak's OSM Safety Result	emests, Corp.	ent Ster	dend Sol	utions and implementation Marks	dologies, it may be more beneficial to align with the recover	mended replacement time	frame of reducidary system	equipment										-				and the second		
	(b). Recommended Timeframe is based on ma	posity of Aquip	erent h	nalth in	dees				125/07/20													RECOMMEN	DED REPLACEME	INT TIMMING (8	Saned on Trigge
otes						els. A number of New Cables may be required if location of																Cornellino	s only listade : implementation	n methodologie	for Solutions,
	(d): As a retrievum requirement, Rubber Seals	Air filter and	Berrie	th and L	inks are required to be repaided by	the recommended tiresframe. New Marshalling Hooks sh	ould be careidened if Doit	ing Cables are to be resplay	14.				_			1000			_		YARD	72.00		_	YARD
BAY	CBP PANEL					SECONDARY SYSTEMS EQUIPMENT	2			X-9	907	7-81	tor	AUX 6	CTFL	METE		025	MAN	CARLES (MB	MARSHALLING	(Charrie)	Sec Sys Egispreent	CARLES	MARSHALLIR
						T			_											CAP Panels to	RECENS (MI)			C&P Penels to	EXHES
																				HVYwd	Yard Marshalling		Sec Sys	Marchalling	Yard Marshalling
Earthon	Panel Descriptore	Panel No.	Tea	н	Functional Loc.	Description	Manufacturer	Model receiper	Checksonius (No./ No.)	ert age	н	et age	*	Mt. Age	н	HT. 440	н	10. Age	HI	Marshalling	Gosla (CD, MK,	C&P Panels	Equipment &	Hosts (CR,	Resisticity M
									(Amr.), part)											Klosko (CB, MK, CT, VT, AC, DC,	CT, VT, AC, DC, CDOURNE		Auxiliary	MK, CT, VT,	CT, VT, AC, D
																				COOLING	STORES .			AC, DC, CDDUMED	COOLING
BUS JONE (2758V-4C1)	275AV 1 BUS - BUS ZONE, CB FAIL BUS TRIP'S	42A1	200	3.14	H005-055-1805-BAYCONT	BEING TE TERMINAL UNIT FOXBORD CSO	FORECEO	cio	Yes				-	20.88	5.44					3.54	3.54	>2044	2020/30 (6)	>2044	> 2664
	AND Y PROTECTION CURRELE				9905-535-1815-XPROT	RELAY DITT AREVA MTACSA RANGE, 25-325VAC	AREVA	MFAC34	No No	10.00	5.44		-												
					9005-555-18U5-8PROT 9005-555-18U5-8PROT	RELAY TERPING LOW BURDEN ALSTON MAKES BHAY TERPING LOW BURDEN ALSTON MAKES	ARPYA	MVAGE	No	10.66	5.44													ı	I
					HOOK SAN SBUS BPROF	RELAY TREPPING SUPPLY HAS AUXTOM MYWICZ	ARRIA	MAKES -	No	10.88	5.44													ı	I
					HOOS SSS SBUS-RPROF	RELAY CREATE BUS TRIP RACK	RMS	CR FAIL TRIP BACK	No	10.86	5.44									1				ı	I
					W005-555-58U5-XPROT	RELAY CO FAIL BUS TRIP RACK	RMS	CB-FAIL TREP BACK	No	10.00	5.44													ı	I
					9005-055-19U5-19ROT MOOL SAL 18US-19ROT	BELAY TREPPING LOW BURDEN ALSTON MINALS BRIAY TREPPING LOW BURDEN ALSTON MINALS	AREVA	MVA/S3	No No	-		1088	5.44											1	I
					HOOS SIG 1805 1980T	BRIAY TREPPING SUPPLY FAIL AUTOM MVAXS2	AREVA	MVAXLE	No	_		1088	5.44											ı	I
					H005-SSS-SBUS-199(OT	RELAY DITE AUSTOM MEACON RANGE 25-225YAC	AUSTOM	MEACH	No			10.88	5.44											ı	I
			_		HOOM SIGNATURE REPORT	RRAY CRIMA, BUS TRIP RACK	EMS.	CR FAS TRIP RACE	No			10.88	5.44												
BUS 20NE (275kV +8C2)	275kV 2 BUS - BUS JONE, CB FAIL BUS TRIP X AND V PROTECTION CUBICLE	12A2	2905	3.14	M005-055-28U5-BAYCONT	REMOTE TERMINAL UNIT FOXBORO CSO	FORBORO	C50	Yes	19.62			1000	10.62	5.31		-7			3.54	3.14	>2044	2029/30 (b)	> 2046	> 2044
	AND 1 HOUSELION COMCSE				H005-055-28U5-XPROT H005-055-28U5-XPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MIVAKES RELAY OR FAIL BUS TRIP FIACE	AREVA BMS	CB FAIL TRIP BACK	No.	18.62	5.30				_	_	-	_					7.216	1	1
					MODB AND DRUG SPROT	BRIAY CREAT BUT THE RACK	man.	CB FAB TRUP BACK	No.	30.82	8.83				-									ı	I
					H005-SSS-28US-8PROT	RELAY DITT AUSTON MEACON RANGE 25-325VAC	ALSTOM	MEACH	No	10.62	6.85	100	5.00							1 1				ı	I
					M005-555-28U5-MPROT	RELAY OF FAIL BUS TRIP RACK RMS SASSIKS	RMS	CB FAIL TRIP BACK	No	-5160		17.36	9.60											ı	I
					M005-555-28U5-MPROT	RELAY TRIPPING SUPPLY FAIL ALSTON MIVAKES	AREVA	MVAXI2	No			1062	5,31		- 1									ı	I
					H005-555-28US-1980T H00A-555-28US-1980T	RELAY DITT AUSTOM MEACH RANGE 25-325VAC. BRIAY CRIFAL BUS TRUP RACK.	ALSTOM EMIL	CB PAS TREP NACE	No.	-		1062	5.81	$\overline{}$	-	_	-	_						ı	I
J RES COUPLER CHIEF	TIGHU BAYORS BUS COUPLES X AND Y	+657	200	8.14		BRACTS THROUGH UNIT FORBORD CAD	FORECRO	CND CND	Yes	_		10.62	5.65	20.49	5.20		_		_	3.34	8.34	> 2066	2029/30 04	> 2088	> 2066
	PROTECTION CURICUS	-	1		W005-SSS-601-XPRCT	RELAY CE MIGHT GE CEO (VER 2.50 FREMWARE)	66	G0 (VER 2.88)	Yes	1240	5.30											-			
economica di			100	100	9005-SSS-401-1990T	RELAY CEMAN SEL-BSL-1 (1A)	SCHWEITZER	561-361-1 (1A)	Yes			10.29	530	1000							500,250 38	230/02	100000000000000000000000000000000000000	2-20000	
3 TIMR (1328V +017)	133NV BAY -057-Q38 3 TRANSFORMER LV	+300	3905	3.14	M005-555-443-5AVCONT	REMOTE TERMINAL UNIT POSITIONO CSO	PORBORO	C50	Yes				-	10.53	5.27					3.54	3.14	> 2044	2009/30 (b)	> 2044	> 2044
	CUBCLE			1	H008-555-441-6990T	RELAY CRIMONT OF CHO (VER 2 ST PRIMWARE)	SCHWEITER	080 (WR 2 RE)	Yes	18:60	5.38	10.51	6.22												
S TRMR (1308V +006)	1836V BAY-DOM-COD S TRANSPORMER LV	+348	1000	3.54	The state of the s	REMOTE TERMINAL UNIT POSSORO CSO	FOREGRO	200	Yes		-	10.81	5.47	20.24	5.12	_	_		-	234	2.14	>2044	2029/30 (64	>2006	> 2044
a treat page - and	CUBICIE	120	-		H005-055-H5-KPROT	RELAY CO MONT GE GEO IVER 2.50 FREMWARE)	96	G60 (VER 2.99)	Yes	10.60	5.38			2024								74000		7.000	
					9905-555-445-1990T	RELAY COMIAN SEL-355-5 (SA)	SOWETERA	581-366-1 (1A)	Yes			10.34	5.12				17 0		100		33 3	- 3			1
CAP (1308V =012)	1326V BAY-012-Q16-CAPACITOR BANK MISS	STAR	3905	3.14	The state of the s	REMOTE TERMINAL UNIT FOXBORD CND	FORECED	CNO	Yes				- 1	80.48	100.00					3.54	3.34	× 2044	2005/30 (b)	> 2044	> 2044
	K AND F PROTECTION CUBICLE				H006-535-681-POWRUE H006-535-681-87907	RELAY POW SE CONTROLLER MITSUREEM DTCB	MITSURE	SS CONTROLLER	No.	10.68	5.26			11.63	5.61	_								ı	l .
					H005-555-481-10907	RELAY CAP PROTIN ARRESPACEOC	ARR	SPAISABC SPAISABC	No	10.46	534													ı	I
					M005-SSS-481-KPROT	RBAY COMONT GE GGO NER 2.50 FRMWARD	30	GRO IVER 2.900	Yes	13.60	5.30									1				ı	I
					M005-555-481-MMOT	RELAY TRIP MONITORING RMS 3420026	RMS	5A10K26	Yes	1		15.99	6.00							1				I.	I
					M005-555-461-MPROT	RELAY CEMAN SEL-351-1 (LA)	SCHWEITER	581-381-1 (TA)	Yes			10.48	5.24												
CAP (1808V +D11)	3 SHOW SAY WELL-QUE-CAPACITOR BANK MICE. IX AND Y PROTECTION CURICLE.	+9451	300	8.14	The same of the sa	REMOTE TERMINAL UNIT FOXBORD CSO	FORGOTO	Cid	Yes	-				11.63	5.24		-	_	-	8.14	8.14	> 2066	5009/90/94	> 5044	> 2044
	IX AND FIREITECTION CUBICLE				H005-SSS-482-POMINUS H005-SSS-482-KPROT	RELAY POW'SS CONTROLLER MITSURSHI DTCB RELAY OC & ET ADD SPAISHOC	AND AND	SS CONTROLLER SPALSABC	No.	12.49	5.34			11.60	5.81									ı	I
					M005-555-483-WMOT	BELAY CAP PROTIV AND SPALIFOC	A00	SPACEOC .	No	10.46	5.24													ı	I
					H005-555-482-87907	RELAY CO MOMT SE OSO IVER 2.55 FREMWARE)	68	080 (VER 2.9%)	Yes	10.60	5.30	17.75	73.71							1				ı	I
		-	-	-	MOON SUGARE - MPROT	BHLAY CRMAN IRL-INL 1 (TA)	SCHWEITER	581-981-1 (1A)	Yes			10.48	8.24		-					_				_	
VC HIVE	IVC HMI PANK	HMI	300	3.00		RHAY BASHD ORY ARE RETUZE	ARR	88T 821	Yes No	-			-	11.18	5.50					2.00	2.00	> 2008	Som/en bit	> 1068	> 3048
					H005-005-45VC-EVT H005-005-45VC-HMB	ELECTRONIC VOLTAGE TRANSDUCER RECEIVER LOCAL CONTROL FACELTY PC X TERMINAL	R/IZ WYSE	29807	Yes	-					3.45					1				ı	I
					HOOS-SIS-4SVC-GWINTWK	CHECK POINT 1280R IPS BUGGED APPLIANCE	CHECKPOINT	CHIEF	No					4.44	24			2.36	1.06						
VC PROTECTION (HSA.3)	SVC+8A.3 PROTECTION PANE.	+53-1	200	8.48	MOON NAVA ELVIC TRESPROF	RHAY BASHD ORF ARE RETSZS	ARE	88T 523	Yes	11.56	5.59								-	8.43	9.45	> 2048	2008/29 (6)	> 2048	> 2043
			100	100	HOOS SSA, GLVC THERPROT	TRANSFORMER GUARD UNIT	ARR	RK HUSCHS-AA	,	11.18	6.50									6500	2000		- 0000129 S		A. C. C.
					HOOS-SIG-KEYC TREMPROF	SVC TRIP UNIT TEST SWITCH INCOURS 1	ABB	SPER 1C1 RTSP24	No.	11.58	5.50 5.50												1	1	I
					HOOS-SIS-4SVC-TREXPROF	TEST SWITCH MODULE 2	ADD	8TXP24	No.	11.18	5.59													ı	I
					MOOS-SSS-45VC-TREVERGE	LOCKOUT UNIT	A00	L/O UNIT	7	11.58	5.55						7.		0.0		S. 8	100		1	1
WC PROTECTION (HEB.ID	SVC +RB.3 PROTECTION PANEL	+88.5	2000	3.43		RELAY BIASED DEV ARR RETS25	A88	88T 821	Yes			13.58	5.39							3.43	3.43	> 2045	2008/29 88	> 2945	F2043
					WOOD SAS-REAVE-TREVERIET	TRANSFORMER GUARD UNIT	ARR	8X 905003-AA	7			13.38	5.89												
					HOOS-SIS-4SVC-TREVPROT	TEST SWITCH MODULE	A88 A88	DOME 2 1-06008 309163	No	-		11.18	5.50		_	_	-	-						1	1
75KV DIAMETER 1	275AV BAY CES-QUE BUS COUPLED X AND Y	4285	200	3.14		REMOTE TERMINAL UNIT ROUSORO CSO	FONDORO	(50	Yes	-		11.18	3.20	10.68	5.44	-	_	-	_	3.54	3.14	> 2004	2029/30 BI	> 2044	> 3044
DUPLER.	PROTECTION CUBICLE			1	M005-555-591-APROT	RELAY COMONT OF COUNTRY 2 55 FROMWARD	68	C80 (VER 2.99)	Yes	13.65	5.44			-	30.44						.5500	5.55			2.50
					H005-555-901-MPROT	RHAY CRIMOMT SRL 852 1A, 125V/6, 4U	SCHWEITER	181-912 (14) (813	No			10.88	5.44								1				
256V DUMETER 3	JANN BAY CED CHE BUS COUPLING X AND Y	+298	200	8.14		REMOTE TERMINAL UNIT FOXBORD CSD	FORBORD	cse	Yes				1	10.77	5.28				-	8.56	8.14	>2000	3036/80 (6)	> 2066	> 3060
DUPLIK	PROTECTION CURICLS				M005-555-502-MPROT M006-555-502-MPROT	RELAY CEMINENT OF OSD (VER 2.50 FREMWARE) RELAY CEMINENT SEL SEZ 1A. 125WE, 4U	GE SOWN/DER	050 (VER 2.90) 561-362 (SA) (AU)	Yes	18.77	5.38	10.77	5.38											1	
75KV DIAMPTER 3	275KV BAY CB3-Q36 BUS COUPLER X AND Y	+2811	200	5.14	M005-555-503-8AKCONT	REMOTE TERMINAL UNIT FOXBORO (50	FORBORO	(50	Yes			10.77	2.58	10.79	5.95					3.14	3.14	+2044	2029/30-04	> 2044	> 2044
DUPLER	PROTECTION CURICLE	977.00	100	16.7	M005-553-503-67907	RELAY CE MOME OF OND (VER 3 SS FIRMWARE)	108	CBO (VER 2 94)	Yes	10.78	5.38			17.7	111					0073	127.7	7.7.7.5	College	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	COMP.
3713					HOOK SALEDS HPROT	BRIAN CRIMGMETER BRZ 18, 128WE, 60	SCHWEIGHE	181-162 (10) (813	No			10.71	6.38												
766V DUMBS SER 4	J796V BAY CON QUE BUS COUPLER X AND Y	+2A11	300	8.14	CONTRACTOR SPECIALIST	REMOTE TERMINAL UNIT FOXBORO CSO	FORGORD	C50	Yes					\$0.97	5.40					2.24	3.34	>2046	2029/30 (6)	> 2006	> 2066
DURLIK	PROTECTION CUBICLE				H905-555-594-479-07	RELAY COMOMFOR COLIVER 2.55 FRANKARD	O.C.	050 (VER 2.9%)	Yes No	10.07	5.40	10.57	5.49				-		-						
THEY DISSIPTING S	279aV BAY COS QNO BUS COLUMNS X AND Y	1248	2000	8.14	HOOS-SUS-SON-HPROT HOOS-SUS-SON-SANCTINE	RELAY CO-MICHIT SEL 352: 1A, 125VIC. 4U RHACTY THROUGHS UNIT POSEDRO CND	SOHWETEER POSSORO	SD-352 (\$4) (40)	Yes	_		1037	5.49	30.88	5.44		_		-	3.14	8.34	> 2000	2029/90/04	>2044	h 3066
DUPLER	PROTECTION CURICLE	7.000	200	1	MODE SALESS APROT	ENLAY CRIMONT OF CHO (VHI 2 BY PROMWAPP)	Gas.	CNO (VAR 2.440)	Yes	10.60	8.44				-							- 41000	September 30	7,000	2000
Hill was so	995.534 (NA) A	and the last			H006-535-505-19907	RELAY CE MIGMET SEL SEZ SA, 125VEL, 4U	SCHWEIGSR	SEL-362 (SA) (BU)	No			1088	5.44							1215 7	Commence of				
	275kV BAY CE7-QUE BUS COUPLER X AND Y	4286	300	3.40	W005-SSS-S07-BAVCONT	REMOTE TERMINAL UNIT FOXBORD CSO	FORGORD	cia	Yes					22,18	5.50					141	2.43	>2043	2028/29 84	> 3043	>2043
OUR ER	PROTECTION CUBICLE	19775			COLUMN TO SECURE	RELAY CRIMOMETER ON OVER 2 ST FREEWARPS		444	Yes	11.10	5.59				-	_	_	_		2-4	4.14	F 450500	and the last		



						codulogies, it may be more beneficial to align with the recom-			UIPMENT			_	_	-		-			_		-	NOED REPLACEM	OUT TRANSPORT	lunder Sc
Mag.	(b) Recommended Timefrares is based on the	jority of Figure	meet H	ealth les	dices																	en only, Exclude		
						ne's. A number of New Cables may be required if location of by the recommended timeframe. New Manhalling Kooks of															-	Implementatio	on methodologic	mi
						7						F		100	verte:	REVEN		market	CV. NAV VI	TARD	CSP PANELS	Sec. Sys		NARD
BAT	CBP PANEL		_	_		SECONDARY SYSTEMS EQUIPMENT	Di:			X-0	100	Y-24	10	ALX S	CTREE.	METER		OPSWAN	CABLES	HOSKS (H)	(Chassis)	Eglipment	CANES	MARSHALI
Function	Penel Descriptos	Panel No.	Year	M	Functional Loc.	Description	Mensfecturer	Model number	Obsolection (No./No)	tff. Age	н	ETT. Age	н	ETT. Ages	н	ET. Age	н	DT. Age. 15	CAP Pare HV No Marchal Gesis (CR CT, VT, AC CDOUN	Yard Marshalling Kodks (CB, M MK, CT, VT, AC, D CC, COOLING)		Sec Syn Equipment & Aurillary Correposents	CBP Panels to HV Yard Manshalling Hooks (CB, MK, CT, VT, AC, DC, COOLING)	Yard Mershall Klosks (Ct, CT, VT, AC, COOLIN
TFMR (2758V + C87)	275/132/18.5XV 3 TRANSFORMER 2754V BAY	+3AS	2009	3.54	H005-025-543-BAYCONT	REMOTE TERMINAL LINET FOXBORD CSO	FOXBIORO	CS0	Yes		0.00			18.70	5.35				3,14	3.14	> 2044	2029/30 (6)	> 2044	>2044
	-cox-disocnative	0.5	54000		HORE SILE SEE SPROT	RELEX TRAME OUTCOM OF FIS (2.00) RELEX DEV 25-105V LEGUS ARRVA MERCIA	66 65704	FRE (2.00)	Vac No:	10.82	5.85		-				-			100000	0.000		955.000	555.0
					H005-015-543-XPROT	RELAYTRANSF DIFF OF TRO CLASS	OE .	760 (3.46)	Yes	10.70						-		-	+	- 1			1	1
			\perp		H005-555-543-YPROT	RELAY BIASED DIFF SEL 387-5 (SA) (SU)	SCHWETZER	SEL SECTION (DU)	Yes	1010		30.70	5.35		_				_					
THAN (2754V = CD4)	275/112/16 SIV 5 TRANSFORMER 275KV BAY -CO4-Q20 CUBICLE	+2432	2009	8.14		REMOTE TERMINAL UNIT FOXOCRO CNO	FOXBID BO	C54	Yes		5.49		_	13.97	5.49		- 21		8.14	8.14	> 2046	3039/80 66	> 2044	> 204
	-OH-GIP CORCU				H005-515-545-XPROT H005-515-545-XPROT	RELAY TRANSF O/LOAD GE 195 (2-95) RELAY TRANSF DIFF GE 190 (2-46)	OE OE	F35 (2.93) T90 (3.46)	Yes	10.97			-		-		-		1	- 1			1	1
					HOSE GGS SAS OFFICET	RELAY DEF 25-325V LPOLE ARRVA MEACLA	AREVA	MFACM	No	7.14	167								1	- 1			1	1
	-		-		H005-555-545-YPR01	RELAY BARED DIFF SEC-SET-5 (1A) (RU)	SCHWETZER	591-387-5 (34) (91)	Yes			30.97	5.49						_	- 1	-			-
AP (275RV = C06)	275KV BAY +CDS-Q10-CAPACITOR BANK MOD II AND Y PROTECTION CURICLE	+2A6	2009	3.14	H965-515-563-6AYCONT H965-515-563-POWAYE	REMOTE TERMINAL UNIT FORDORO CSO CB SB22 POINT ON MAYE RELAY	FOXBORO ABB	SWITCHING 2/3	Yes					10.56	5.28		-		3.14	3.14	> 2044	2003/30 (6)	> 2044	> 2044
				1 (HORS-SSS-SSS-SPROT	RELAY CAP PROTINGES SPILITED	888	SPA/SECC	No	10.56	6.38			and the	2000				1		1		1	
	1				H005-555-583-XPROT	PELAY DEP AUSTOM MEACHA RANGE 25-325VAC	ALSTOM	MFACM	Net	10.56	5.26								1		1		1	1
					H905-535-563-XPROT H905-535-583-YPROT	RELAY ON MONT OF COOTYPE 2.50 FIRMWARE) RELAY CAP PROTIN ARE SPACEOC	500	G60 (VER 2.10) SPA/360C	Yes	18,60	5.30	90.56	6.10				_		-	1				
					HOS SILSES YEADT	RELAY CAP PROTE ARE SPECIAL.	688	SPA/360C	No			30.56	5.28						1	- 1			1	1
					H005-535-585-YF90T	FELAY COMAN SEL-355-1 (LA)	SCHWEITZER	581-951-1 (IA)	Yes			10.56	5.26											
VC (275kV =007)	275ky BAY COZ-QLO SVC FTEDER X AND Y	+3A3	2000	3.40		REMOTE TERMINAL LINET FORBORO CSO	FOXBORO .	CS0	Yes			200		11.30	5.50		- 177		3,43	3.43	> 2043	2028/20 (6)	> 2040	> 204
	PROTECTION CURRCLE				HOSE USESSE SPECT	RELAY CE MOMT OF CEO (VER 2 TO FRANKING) RELAY CE MOMT SH, INC. 14, 125V/IE, 40	SCHWITTER	SH-957 (TAL 980)	Vec No.	11.18	5.50	11.18		-	-	-	-		1	- 1			1	
NV FEEDER 7190	132KV FEEDER 7130 (004-010 - MUNGAR)	+5011	2009	3.14	THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.	PEMOTE TERMINAL UNIT FOXBORO CSO	FOXBORO	C50	Yes			11.10	220	13.40	5.25				3.14	3.14	> 2044	2025/30 88	> 2044	> 204
140	CUBICLE X & Y PROTECTION CUBICLE	TON1954	2000	-	H905-515-7190-10760T	RELAY DISTANCE MICCOM PHAZ (WITH R/PORT)	AREVA	PHIZ (WITH B/PORT)	Yes	50.49	5.25				-				32.55	10071	00000	0.588088	1000000	0.000
V PREDER 747 (+0 (5)	1500 FEDER 747 (DES-QUO-TRAVERSTON	-187	1000	5.14	H005-555-7190-VPROT H005-555-747-BAYCONT	REMOTE TERMINAL UNIT FOROROGO	SCHWEITJER FOXBORO	581-3130 (1A)	Ves			30.49	5.35	17.00	1.70	-	-		3.14		2.700	1018191.81	- 2004	> 204
A LEGISTAN INDICA	TEE GYMPHE CUBICLE IS A PRICTECTION	+987	2009	3.14	H005-015-747-450/T	DEWAR DMILLOS PROT SIG VE 90-32-0V SUPPLY	DEWAR	0M1200 VF	Yes						5.25	-			2114	3.34	> 2046	2029/50 84	> 2044	
	CLUBECLE			1 8	H005-555-747-95RT	DEWAR DMILLOOPROTISIC VF 90-230V SUPPLY	DEWAR	DW1300 VF	Yes						5.71		-		1	- 1			1	1
					H005-565-740-39907 H005-565-740-39907	RELEY DISTRICT MICOM PAGE (WITH R/FCRT)	AFFUA	PMD (WITH R/PORT)	Yes	13.31	6.66						-		-	-			1	
NA CENTRALIS THE CARRY	SION FEEDER 748 (DSI-QLD-COORCY TEE	+386	1600	3.14		RELAY DISTANCE SEL-301C (IA) REMOTE TERMINAL UNIT FORDORO CSO	SCHWEITZER FOXBORO	SEL-SEEC (LA)	Yes	_	-	30.46	5.25	10.53	5.27	-	_		3.14	3.14	> 2044	2025/30-bit	> 2044	> 204
	GYMPH) CUBICLE X B Y PROTECTION	1,540	-	-	HOSE GELTAN PERIT	DEMAR ONE 200 PROTISIS OF 90-320V SUPPLY	DEWAR	OM\$200 VF	Yes						6.71				-				- AMIC	
	CUBACIE			1	H005-555-748-75RT	DEWAR OND, 200 PROT SIG VE SG-820V SUPPLY	DEWAR	DW2500 At	Yes					11-41	5.73					- 1			1	1
					H905-535-748-XPROT H905-535-748-YPROT	RELAY DISTANCE MICOM PHAI (WITH R/PORT) RELAY DISTANCE SEL-001C (SA)	SOMETER	PAG (WITH INFORT) SEL-BLSC (LA)	Yes	30.53	5.27	12.69	634				-		-					
BV FERDER THAT (+DICE	SERVINESER NA (DOLGIO, RICEAR)	+864	1009	8.16	HORE SIS 764 BAYCONT	REMOTE TERMINAL UNIT FOXBICHO CNO	FOXEDRO	CSO	Yes			44.07		10.25	5.18	$\overline{}$	_		3.14	8.14	> 2044	2029/30-04	> 2044	> 204
	CUBICLE V & Y PROTECTION CUBICLE	23366	200		H005-535-764-P501T8	DENIAR GMILZOS PROT SIG VE 90-320V SUPPLY	DEWAR	0MS200 VF	Yes						5.73				100	1557.0	0.00	25/9/27	3,572.5	2728
	Paragraphic Company of the Company o				H005-535-764-PSPITB H005-535-764-XPROT	RIFL STAS PROTISIS VT 2 TONE I/O 48-125V CURR DIFF RELAY MICOM (948 + 2ND PORT	NU SESCINONICS MICOM	9745 WF PS40 in 2nd Ports	Yes	13,50	6.76		_	19.25	5.13		-		-	- 1			1	1
					HOSE SILL 764 VERGT	RELEVIDATIONS SELECTED TO THE PORT	SCHWETTER	SHLADC(DA)	Yes	LANO	9.75	26.51	8.75		-				1	- 1			1	1
BY FEEDER 785 I+DIS	LISTRY FEEDER 765 (DOS-QLO-NUENAN)	13A3	2009	3.14		PEMOTE TERMINAL UNIT FOXBORO CSO	F0X8090	C50	Yes			-		10.37	5.39				3.14	3.14	> 2044	2025/30-03	> 2044	> 204
	CUBICLE X & Y PROTECTION CUBICLE			1 1	H905-515-765-PSDITB	DEWAR DNI1200 PROT SIG VESO-320V SUPPLY	DEWAR	OM1200 VF	Yes						5.71					- 1				1
				1 8	H005-005-765-7691TB H005-005-765-32RDT	RELETES PROTEIN W.2 TONE UD 48 1254 COMMIS INTRIPACE UNIT ALSTOM PHIS	RELECTIONICS AUSTOM	MOME OF PROC INNOCO	Yes	18.50	6.75		\rightarrow	10.37	6.50	-	-		1	- 1			1	1
					H965-515-765-XPROT	CURR DITY RELAY MICOM PS48 + 2ND PORT	MICOM	P543 (+ 2nd Port)	Yes	38.56	5.28									- 1			1	1
	CHARLES AND ADDRESS OF THE ADDRESS O	2.57			H905-555-765-YPROT	RELAY DISTANCE SEL-031C (SA)	SCHWEITZER	SEL-DESC (EA)	Yes			20,27	5.00							2	10000		0.007	50000
EV FEEDER 807 (+CO)	27KOV FERDER 807 (CS2-QS3 - SOUTHPRNE) CURROLE N.A. Y PROTECTION CURROLE	+289	1009	8.34		REMOTE TERMINAL UNIT FOXBORD CSO	FOXBORO	CS0	Yes				-	13.86	6.07	-	-		3.14	8.14	> 2044	500 6/30 (64	> 2044	> 204
	THE RESERVE TO SECTION CONTROL				H005-001-807-PSHTV H005-003-807-PSHTA	DESIGN DALLOW PROT SIG DIG UD 48: SJAV DESIGN DALLOW PROT SIG DIG 90-520V SUPPLY	DEWAR	DW0200 DIGITAL	Yes				_		4.41				1					
	1				H905-555-807-#55(TB	RFL 9745 PROT SIG DIG U/O 48-525V	RFL ELECTRONICS	9745 DIGITAL	Yes						6.07						1		1	1
					H005-535-807-XPROT	CURR DIFF RELAY MICOM PS46 + 2ND PORT	MICOM SCHWEITZER	PS66 (+ 2nd Port) 591-421 (1A)-(910	Yes	10.88	5.44	30.88		-			-		-	- 1			1	1
N FEEDER (SO F-CO)	275KV FEEDER 818 (CIB-Q18 - PALMWOODS)	+2012	2009	3.14		RELAY DISTANCE SEL-421 (DA) (SUI) REMOTE TERMINAL UNIT FORDING (SO	POMBORO	(50 (50	Yes		_	30,66	3.44	10.70	5.30	-	-		3.14	3.14	> 2044	2025/30 (6)	> 2044	> 204
	CUBICLE X & Y PROTECTION CUBICLE	-	1	1	H005-555-810-PSP(T	DEWAR DNELDGE PROTISIC DIG 90-320V SUPPLY	DEWAR	DMS200 DIGITAL	Vec						5.30					1		The same of		
				1 3	HOUSE SESSION POSITA	DENIAR DMILZOD FROT SIG DIG 90-220V SUPPLY	DEWAR	DAZZOS DIGITAL	Yes				-		6.06					- 1			1	1
				1	H005-003-810-750/TB H005-003-810-XPROT	RELAY CURN DIFF DISTANCE MICCOM PS46	ARDIA	9045 DIGITAL	Yes	10.70	5.39		-	12.54	6.07	-	-	-	-	- 1			1	1
	A CONTRACTOR OF THE PROPERTY O				HOSE SILE SID YESOT	RELAY DISTANCE SCHWIZER 421-5 1A 24 1ED	SCHWEITZER	SEL-RUS (SA) (SU)	Yes	20.70		9.00	4.50									THE STREET	12922	A
IN PERDEN 834 I+COV	279KV PREDER 83A/3 (000-020 - CALLIOPE	+287	2009	5.14		REMOTE TERMINAL UNIT FOXBORD CSD	FOXEDRO	CNO	Yes	700		1		10.68	5.34				3.14	3.14	> 2046	2025/50 81	> 2044	> 20
	RIVER THE GIN GINE CURICLE X & Y PROTECTION CURICLE				H005-535-834-3PB0T H005-535-834-VPB0T	RELAY CURR DIFF DISTANCE MICOM PSAN RELAY CURR.DIFF ABB REDATO DAVID	ARR	P548 REDE/1911.2	Yes No	10,58	5.34	455	2.30				-		-		100	5100000	100000	1
V FERDER ROLLWARS	STREAM SHEDER KT \$/809 [COT-COO - CALLLOPS	+284	3011	2.57	HOSS SIS-BIS-BAYCONT	PENCTE TERMINAL UNIT FORGORO CSO	FOXEGRO	C50	Yes					13.88	5.44				8.14	2.57	> 2046	2005/82 (6)	> 2006	> 20
0	MINER TEE GIN GING CUBICLE K & Y				H005-535-815-30907	RELAY CURR DIST DISTANCE MICCOM PS46	ARFVA	P546	Yes	10.23	5.11													
V FEEDER MISSO	PROTECTION CURROLE 27%CV FEEDER RESO (COS-QUO - TERRIAR	4,644	100	240	H905-535-815-YPROT	RELAY CURRUPIT AND REDICTO DAPO	ARR	RED678VL2	No.			0.44	0.22	10.70	6.00		_		3.14	244	2,200	2009/90-04	2000	>20
IV FERDER BESID	CREEK CURRETS IN A A MOLECTION CORRESPONDED	12830	2006	* 34	HOSS-SSS-BASO-BAYCONT HOSS-SSS-BASO-PS-PTY	REMOTE TERMINAL UNIT FORDORO CSO DENAR DMILJOS PROTI SIS DIS SIS 220V SUPPLY	PONBORO DEWAR	DVS200 DIGITAL	Yes				- 1	12.32	6.08				3.18	334	> 2006	accelorate (e)	> 2084	>20
1.6				1 3	H005-555-6850-PSUTA	DEWAR OND 200 PROT \$16 DIG 90-520V SUPPLY	DEWAR	DIVISIO DIGITAL	Yes					19.70	5.39				1		1		1	1
	1			1 8	H965-515-8650-P15/TB	RFL 9745 PROT SIG VF 2 TONE UO 46-1254	MILELECTRONICS	9745 WF	Yes	-	-			10.70	5.20				4	1	1		1	1
					HRES-SSS-RESO-RPROT	CURR DITT RELAY MICOM PS44 + 2ND PORT RELAY DISTANCE SCHWIZER 433-5 TA 24 LED	MICOM SCHWEITZER	PS44 (+ 3nd Port) S81-421-5 (14) (\$1.0	Yes	30.72	6.26	9.00	450				-		1					
N BUS ZONE BOST	SSERV 1 AND 2 - BUS ZONE, OD THE BUS TRIP	+3A2	1009	3.14		REMOTE TERMINAL UNIT FORBORIC CSD	FORBORO	C50	Yes				120	10.53	5.27				3.14	3.14	> 2046	2025/30 68	> 2044	> 20
	PROTECTION CUBICLE	1 2000			H905-515-824-YFROT	RELAY BUS ZONE SA 125V SEL-467B (R124)	SCHWEITZER	SEL-4679 (RE16)	Yes			20.53	5.27						132	82875	37.522	-11	5777	100
					H005-555-824-YPROT	RELAY BUS 2016 TA 135V SEL-467B (R124)	SCHWEITZER	SEL-4979 (RS16)	Yes			30.68	9.27						4		1		1	1
				10	HOOS-NIS-REAL-YEROT	RPLAY 9/15 20 MF SA 125V SPL-4879 (R124)	SCHWEITZER	SEL-4879 (RL16)	Yes			30.53	5.27		- 1				11		1		1	1
N DUS DOME NOT	SANNY 1 AND 2 - MIS TONE OF DAY BUT YELD	1361	3600	3.14	WINE OUR RISK WEBST	BRIGH BUT TORK IN CIRCURS AND DECKE	SCHOOL TORK	281-4878 (RC181	Yes	10.53	6.37								314	914	> 2044	3009/30 84	> 2044	2.50
BV BUS ZONE (KD1)	STORY S AND 2 - BUS ZONE, CO CASE BUS TREP Y PROTECTION CLOSECUS	*Mi	2000	3.14	H005-535-824-XPROT H005-535-824-XPROT	RELAY BUS 20 HE SA 125V SEL-4678 (R124) RELAY BUS 20 HE SA 125V SEL-4678 (R124)	SCHWEITZER SCHWEITZER	581-4678 (NL16) 581-4678 (NL16)	Ves	10.53				7 1					3.14	3.14	> 2044	2625/30 (b)	> 2044	> 204



						SKV SUBSTATION AND SVC SEC																			
	(b): Recommended Timeframe is based on ma					dolegies, if may be more beneficial to align with the recommend	net replacement than	name of sedendary systems	diffment														DED REPLACEME		
Hasi	(c): Based on Visual Inspection and Subject to	the decision o	if the Cor	nanol Bu	diding and Secondary Systems Pare	els. A number of New Cables may be required Fincation of cost																Condition	s only, Exclude o		
	(c): As a minimum requirement, Rubber Seats,	Air filter and	Terminal	is and t	links are required to be repailed by	the recommended timeframe. New Marshalling Klooks should	be considered if boilt	ing Cabliss are to be reaplaced							_		_						Physical Letter	ner source green	
LW .	CRF PANEL					SECONOMY SYSTEMS EQUIPMENT				X.D	HOT	Y-01	TOP	AUX & C	THE	METER		OPSIA	NAM	CANLES (HI)	MARSHALLING MOSKS (HI)	(Chessis)	Sex Ses Equipment	CABLIS	MARCHALLE KOSKS
Function	Panel Description	Panel No.	Year	н	Parellonal Loc.	Description	Menufacturer	Model number	Obsciescence (Nex / Next	ET. Apri	н	EFT. Ages	3	er Age	н	ell Age	×	T. Age	н	CSP Penels to HV Yard Marshalling Kinsks (CR, MK,	Yard Marchalling Klocks (CB, MK, CT, VT, AC, DC,	CSP Fanals	Sec Sys. Couloment & Asollery	CSP Family to HV Yard Marshalling Klesks (Ch.	Yard Marshalling Klosks (CR, M
	A C 11/1/2000				1919112119							und 22								CT, W, AC, BC, COCUNG)	COOLING		Components	MIL CT, VT, AC, DC, COOLING)	COCUMS
POWAN CANADA	OPSWAM OUTDOOR CAMERA	OUTDOOR	2000	0.00	HIDS-SIS-IONS-HARDWARE HIDS-SIS-IONS-HARDWARE HIDS-SIS-IONS-HARDWARE	AND ETHERNET CAMERA ASSEMBLY HOSSWCOA AND ETHERNET CAMERA ASSEMBLY HOSSWCOB AND ETHERNET CAMERA ASSEMBLY HOSSWCOC	Take a Look Take a Look Take a Look	PS625-E PS622-E PS532-E	No.									4.61	5.81 5.31	N/A	N/A	N/A	N/A	N/A	***
EVENUE METERING	SIGN REVENUE METERING CURICLE	1343	1000	3.14	HOOS-SIS-METTN-HEVINETS	WH/VARH METER (CHEDG)	CDMM .	RS202 & DOWARD MOM.	Yes							4.37	2.15			3.34	3.14	> 2044	2029/30 (b)	> 2044	> 2044
					HOOS SIG METR REVMETS	KWH/KKRIN EDMI 2000-0400 CLO.S REVENUE	FDMI	3000-0400 tA CI 0.5	Vec						_	10.53	6.20	_	_						
					HIDS-535-METS-REVMETS HIDS-535-METS-REVMETS	METER KWH/WARE IA 110VSER CL2/SQUEV) KWH/WARE EDAS 2000-0400 CL0.3 (CHECK)	PDM1	2000-0400 (A CI 0.5 2000-0400 (A CI 0.5	Yes						-	10.53	4.28 5.27	-	_						
					HOOS-CLS-MET'S-REVMET'S	KWHYOWAN EDWI 2000-0400 CL 6.5 REVENUE	CDMI DMID	2000-0400 SACIOS	Yes						_	10.25	5.18	_	_						
					HOSE COLDETTS REVISETS	PWH/GUBBH FORE 2000 0400 CL B.S CHECK	FEMAL .	2000 0400 1A CI 0.5	Yes							10.25	5.13								
				1	HOOS-SIS-METTR-REVINETS	KWH/KKWRH EDWI 2000-0400 CL 0.5 CHECK	CD041	2000-0400 SACI 0.5	Yes							6.46	4.23								1
					HOOS-SIS MICTO REVINETS	EWH/YORKER EDMI 2000-0400 CL 0.5 REVENUE	SDM1	2000-0400 SACIOS	Yes							18.37	5.10								
IDG+5 COMMON	2758W CONTROL BUILDING 1/2	+281	2009	8.14	HIDS-ASS-NBAY LCF2	LOCAL CONTROL PACILITY SUN ULTRA 26	SUM	SUN ULTRA 25	Yes						6.44					1.34	8.56	> 2044	2029/10 (k)	> 3044	> 2044
PSWAN NSC/LCF	NGC/LCF/COMMON RTU AND ORSWAN CURICLE				HOUS-USS-NISAY-LC72/NT	REMOTE TERMINAL UNIT FORBORO (50)	POXBORO	C50	Yes						5.45		_								
	Company of the Compan				HOOS-SSS-NBAY-NSCLINISS HOOS-SSS-NBAY-NSCLINISS	REMOTE TERMINAL UNIT FORBORO CSO REMOTE TERMINAL UNIT FORBORO CSO	FORBORD	C50	Yes						5.49				_						1
					HIDS-SIG-BRAY-ROCURGO	WASTER LISVIC/SERVAC 1800W	MIRONO	RM18320	No					10.01	2040		_	10.57	5.40						
					HIXES-SSS-NISAY-CWINTWICE	SOCAL CONTROL PACILITY PC & TERMINAL	WYSE	V90.EW	Yes										4.70						
					HOOS-SSS-NIBAY-OWNTWICE	LOCAL CONTROL FACILITY PC & TERMINAL	WISE	VIOLEN	Wed									6.78	4.76						
					HIDS-555-BBAY-OWNTWICE	SWITCH BPORT	MUSCROCOM	RS8000A-HS-MM-MS	No									4.39	3.66						1
					HIROS-SSS-NIBAY-OWNTWICE	SWITCH E/NET SEPRE RUGGED REGESOR-OPSWAR	NI/GOZDCOM	RSG2300 (31FT) 46VDC	No						_		_	4.32	3.60						1
					HOSE SIS NEAT OWNTHIS	SWITCH (/WET 32 PRT RUGGED IS 02300 OPINIAM	RUGGEDCOM	RSG2300 (319T) 48VDC	No						-	-	-		3.60						1
					HIDS-SSS-BBAY-CWNTWK	SERVER PORT 48VOC PERCE 04030450 - 075WAR SERVER PORT 48VOC PERCE 04030450 - 075WAR	PERSON	IOLAN STS DEDC	No		-				\rightarrow	-	-		18.00						1
					HOSE SIGNIAL TIMBER	SPS CLOCK THROW TOWN OIL	THRON	FORM STREET	No.				-	18.79	5.16	-	_	12:00	18,00						
DG+8 COMMON	1323V CONTROL BUILDING +8	1981	2005	8.14	HOOS-SIG-MEAT-LUTSINT	REMOTE TERMINAL UNIT FORBORD (SO	FORBORD	CSO	Yes						5.27		\neg			1.34	8.34	> 2044	2029/90 (b)	> 2044	> 2044
SWAN NSC/LCF	NSC/UCE/COMMON NEW AND OFFWAN		625	1	HIDS-SIS-REAV NICLINIS	REMOTE TERMINAL UNIT FORBORO CSO	ножно	C50	Yes					10.55						1175	57655	0.000	E PERSONAL PROPERTY.	100000000000000000000000000000000000000	
	CURCIA				HOOS-SIS-NBAY-NICLINGS	REMOTE TERMINAL UNIT FORBORO (50	FOXBORD	CSO	Yes					10.53	5.27				100						
					HOSE SSE NEWS COMINANTS	INVESTER 129/DC/380VAC 3600W	MIRONICS	415-862-CN125	No					3600			_	10.53	8.27						1
					HIDS-SIS-MBAY-OWNTWIS	SWITCH ETHERNET 3 + 8 PORT	AULOY	MS88802	Yes						-		-		8.78						
					HOSS-SSS-NEAT-OWNTWICE HOSS-SSS-NEAT-OWNTWICE	SWITCH ETHERNET 3 x 8 FORT LOCAL CONTROL FACULTY PC 3 TERMINAL	ALLOY WASE	MS86802 V9045 N	Yes						-	-	-	5.71	8.76						
					HEIS ASS BRAY OWNTHIS	SWITCH SPORT	KURGEROCOM	RUNDOL HUMANAS	No.						_			4.39	3.66						
					HOOS-SIS-NBAY-TIM/HGD	GPS CLOCK TEXTON TOGGS-0:1	TREON	Toges	Yes					10.73	5.36									0	
75KV FOWER									Yes					5.08	254		\neg			1.71	171	> 2049	2094715 04	> 2069	> 2000
NONITONING	POWER MONITORING PARES.	+363			H005-SSS-NBAY-PWRQUALL	PQ ANALYSER UN POWER UP-2250 VT & RET IN	UNPOWER	UP-2210								_	_	-	-		-	7 40 10	********		
VC OPSWAN	SVC BUILDING +4 OPSWAN CUBICLE	HOPSWAN	2009	3.14	1005-555-NBAY-OWINVRT4	RMERTER 125VDC/340VAC 3500W	ATRONICS	415-892-CN125	No						-	-	-	6.73	5.36	3.34	3.54	> 2944	3058(30 (F)	> 2044	> 2044
					HIDGS SIGNIBAT OWNTHING HIDGS SIGNIBAT OWNTHING	COCAL CONTROL FACILITY PC 8 TERMINAL CONTROL ETHERNET 2 & 8 PORT	WISE	WHEREOZ	Tes						-	-	_	5.75	4.79						
					NGGS-SSS-NBAY-OWNTWISE	SERVER PORT 48/DC PERIZ 04/30450 -OPSWAR	PERLE	IOLAN STSUEDC	No						-	-	_		3.89						1
					HOOS-SIS-NEAT-CWINTHEA	GEN 4 SERVER OPSWAN	Sale	E015000	No										2.02						1
					HOS-SS BBAY CWNTWGG	GEN 4 SERVER OFFWAN	68	F815000	No									2.85	2.12						
					HIDD-USS-NBAY-OWNTWINE	SWITCH E/NET REGOED REMOON 125V OPSWAY	MADDEDCOM	858000W	No										4.72					l .	
					HOOS-SSS-NBAY-OWNTW64	SWITCH E/NET REGGED REMOON LESV OPSWAY	RUGGEDCOM	RS8000 N	No						-		-		4.72						
					HOOS-SSS NEAT CONNTWENT HOOS-SSS-NEAT-TIM NGA	SWITCH 6/86T REGGED RESIDENT LIEV OPENAN TIMENG SYSTEM INCINEERS GPSLTO	MENNENG	R58000W GF5179	No.		-			3.05	1.52	-	-	5.67	4.77						
MASTER OFSWAN	MASTER OF SWAN CUBICLE	0006	100T	8.74	HIXO-000-NISAY-INTOWIT	SUB-INTERROGATION SWITCH - HIGE	COMMUNITRON	STADATAG	Yes		-		_	20.00	-	-	\rightarrow	-	_	171	171	>2002	2027/20 (6)	>2042	> 2042
Paris of Street	and the same same same same same same same sam		****		HOOG-SIG-NIGAY-INVERT	INVESTER BAY 1 RACK 3	MITONICS	UTRO 100	No						8.51								2007/20/20	7 4414	
					HIRE-535-NBAT-OWNTHIS	SWITCH ETHERRET 3 x 8 PORT	AUROY	MSM8802	Yes					777	-			12.00	18.00						
					HIROS-SSS-NIBAY-OWNTHIS	SWITCH ETKERNET 3 x 8 FORT	AUSOY	MS868G2	Yes									12:00							
				1	HOOS-SIS-NBAY OWNTHIS	SERVER PORT 48VDC PERLE 04030450 - 07VWAR	PERSE	IOLAN STSSEDC	No										18.00						
					HIDS-SSS-NBAY-CWNTWK	ROUTH COSCO 2815 - 68VDC - CPSWAM SWITCH CART SUPET RUGGED REGUSION OFSWAM	CISCO NUOSPOCOM	2811-DC 8502300131FT1-48VDC	No.						-	-	-	2.00	7.57						
					HOUS-SIS-NEAT-OWNTHIS HOUS-SIS-NEAT-OWNTHIS	SWITCH E/NET SEPRIT REGIGED REGESSIO-OPSWAN LOCAL CONTROL FACILITY PC II TERMINAL	WSE	V90LEW	No.						-			5.72	4.78						
					HOSS-SSS-NBAT CWPRINT	PRINTER	HEWLETT PACKAGE		Yes										18:00						
					HIDS-SSS-NBAY-OWSERV	MONTOR/KEYBOARD	KCP GLOBAL	C-34178	Yes										18.00						
					HB05-SSS-NBAY-OWSERY	SERVER WITH RAID 2405 CARD - OPSWAN	ICP ELECTRONICS	IMB-Q354-R30	Yes									10.43	8.60						
					HOOS SSS MIRAY RTUD	REMOTE TERMINAL UNIT - ICERTU	FOTBORD	CNO	Yes						30.00				100						
					HIDS-SSS-NISAY-RTUS HIDS-SSS-NISAY-RTUA	RENOTE TERMINAL UNIT - ACORTU RENOTE TERMINAL UNIT - TRANSTU	PORBORO	C50	. Res						10.00										
					HOUS-COS-MOAT-RITUR HOUS-COS-MOAT-RITURO	REMOTE TERMINAL UNIT FORBORD CS0	FORBORD	C50	Yes						5,17	-	\rightarrow		-					1	
					HIDS ASS NEAT VHM	HIS JANCK OF SHOURS \$500 TAGS, FOR SITE	JENON	MET AD	No						1.55										
	3				HOOS-SSS-NBAY-VHMI	HIM ZENON WEESEN/ER PRO - S CLIENTS	25NON	2017-00	No					1.91	1.50					1				3	
DG+2 DC AUXILIARY	BUILDING 42 125V DC X BALTERY		2000	8.33		BUILDING +2 125V DC X BATTERY	SHOR	VRLA (MODEL 90829)															2022		
MEX	BUILDING =2 125V DC X BAPTERY MONITOR AND CHARGER		2000	5.00		BUILDING +2 12NV DC X BATTERY MONITOR AND CHARGES	TECHNOLOGIES	8748-130N/12A-8															2090		
	BUILDING G 125V DC Y BATTERY		1000	8.83		BUILDING +2 125V DC V BATTREY	TECHNOLOGIES FRICE	WINKSU-2 129V VRLA (MIDDEL ROADE)							\rightarrow	-	\rightarrow	-					2003		
	BUILDING 42 125V DC Y BATTER! MONITOR						ACCTUTEA	RF48-120V/12A &							-	-	_								
	AND CHARGER		-	5.00		BULDING +2 125V DC Y BATTERY MOBITOR AND CHARGES	TECHNOLOGIES	MINICSU-2 124V						\vdash	\dashv	-	\dashv	-	-				2000	_	-
	BUILDING 42 12RV DC DISTRIBUTION BOARD			6.00		BUILDING +3 135V DC DISTRIBUTION BOAKD		1												1			2000		
DIS 18 DC AUDICIARY	BUILDING -S 125V DC X BAFTERY		2009	9,17		BUILDING +S 125V DC X BATTERY	ence.	VALA (MODEL 90A29)															2021		
PPLY	BUILDING 43 125V DC X BATTERY MONITOR BMD CHARGER		1009	5.50		BUILDING +5 125V DC X BATTERY MONITOR AND CHARGES.	RECTIFIER TECHNOLOGIES	RT48-130V/12A & MINICIU-2 126V															2029		
	BUILDING 43 125Y DC Y BATTERY			9.17	1	BUILDING +3 125V DC Y BATTERY	DIDE	VPLA (MODEL 20A03)						1	-	-	\rightarrow						2021		
	BUILDING 43 125V DC Y BATTERY MONITOR		_	5.50		BUILDING +3 125V DC Y BATTERY MONITOR AND CHARGER	RECTIFIER	RT49-130V/12A-8							\neg		\rightarrow						1009		
	AND CHARGES		1000	-30		PARTIES AND THE PROPERTY OF A SECURITY OF STREET, STRE	TECHNOLOGIES	MINICSH-2 125V							_		_			4			2000		
	BUILDING 43 125Y DC DISTRIBUTION BOARD		2009																						



Secondary System Condition Assessment Report

H005 132/275KV WOOLOOGA SUBSTATION AND SVC

						5KV SUBSTATION AND SVC SE				HEA	LIM	INDI	CES	AND	REC	OMINIE	MU	ED K	EFLA	CEMENI	TIMEFRA	AMIE			
						alologies, it may be more beneficial to align with the resonant	nded replacement time	frame of seriondary systems	equipment													BECOMMEN	DED BEN ACEM	NT TIMEMENG IP	learni on Trianer
DOG:	(b) Recommended Timeframe is based on re-																					Candition	re only, Exclude	considerations f	or Solutions,
		faced on Visual Inspection and Subject to the electron of the Control Building and Secondary Systems Panels. A number of New Cables may be required if fourties of control building an excendary systems panels in charged. In a minimum requirement, Publish Seals, Sin Otter and Terminals and Links are required to be regulated by the recommended timeframe. New Marketing Kissis, should be considered if Costing Cables are to be recipied.																	implementatio	n methodologie	4)				
Bar	CBP PANEL				at a required to the spaces of	SECONGARY SYSTEMS EQUIPMENT		The second second second		X-PE	ют	**	TON	AUX	S CTRL	REVE		OPS	WAN	cance (m)	VARD MARSHALLING EXCSES (HI)	CEP PARELS (Chassis)	Sex Sys Eqlupment	CABLES	MARSHILLING BLOSES
Function	Panel Description	Panel No.	Year	н	Functional Loc.	Description	Manufacturer	Model number	Charlesons (NE / NO)	DY. Age	н	Eff. Agu	н	DT. Age	N	EM. Agu	н	Eff. Age	н		Yard Marshalling Klastin (CR, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Stc.Syo Equipment & Acritismy Components		Yard Marchalling Klocks (CB, MI CT, VT, AC, DC CDCLING)
VC BLDS +4.00	SVC BUILDING +4 125V DC X BATTERY	1	2008	10.00		SVC BUILDING +4 1254° DC x BATTERY	EXIDE .	V914 (MODEL 90409)	1						_								2000		
UNILIDAY SUPPLY	SVC BUILDING +8 125V DC X BATTERV MONITOR AND CHARGER		2006	6.00		SVC BUILDING HE LISY DC X BATTERY MONTOR AND CHARGER	RECTIFICA TECHNOLOGIES	RT08-150V/128.0. MINKSUP 2 1/5V															2025		
	SVC BUILDING 14 125V DC Y BATTERY		2006	10.00		SVC BUILDING +4 125Y DC Y BATTERY	EXIDE	VELA (MODEL 90A09)													1.		2029		
	SVC BUILDING +4 125V DC Y BATTERY MONITOR AND CHARGER		2008	6.00		SVC BUILDING +4 L25V DC V BATTERY MONITOR AND CHARGER	RECTIFIER TECHNOLOGIES	RT45-110W/12A & MINICSU-2 125V															2028		
	SVC BUILDING +4 125V DC DISTRIBUTION SOURCE		2008	8.00	3	SVC BUILDING NA125V DC DISTRIBUTION BOARD																	2028		

Planning Statementt		18/08/2020
Title	CP.02392 – H005 Woolooga Second Replacement 1	ondary Systems
Zone	Wide Bay	
Need Driver	Emerging compliance risks arising from condition and obsolescence of Woolooga's ageing secondary systems.	
Network Limitation	Woolooga Substation is needed to Queensland's N-1-50MW/600MW maintain Central to Southern Que capability.	h reliability obligations and
Pre-requisites	None	

Executive Summary

Ageing and obsolete secondary systems at Woolooga Substation are increasingly at risk of failing to comply with Schedule 5.1.9(c) of the National Electricity Rules and AEMO's Power System Security Guidelines².

Energy Queensland forecasts confirm there is an enduring need to maintain electricity supply into the Wide Bay area. The removal or reconfiguration of the Woolooga Substation due to secondary system failure/obsolesce would violate Powerlink's N-1-50MW/600MWh Transmission Authority reliability standard and significantly impact the power transfer capability between Central and South Queensland.

The preferred network solution for Powerlink to continue to meet its statutory obligations is the replacement of the at-risk secondary systems by December 2029.

¹ This report contains confidential information, which is the property of Powerlink, and the Registered Participant mentioned in the report, and has commercial value. It qualifies as Confidential Information under the National Electricity Rules (NER). The NER provides that Confidential Information:

must not be disclosed to any person except as permitted by the NER;

must only be used or copied for the purpose intended in this report;

must not be made available to unauthorised persons

² AEMO, Power System Operating Procedure SO_OP_3715, Power System Security Guidelines, V95, September 2019 (the Rules require AEMO to develop and publish Power System Operating Procedures pursuant to Clause 4.10.1(b) of the Rules, which Powerlink must comply with per Clause 4.10.2(b)).

Table of Contents

Ex	cecutive Summary	1
1.	Introduction	3
2.	Woolooga Demand Forecast	4
3.	Statement of Investment Need	6
4.	Network Risk	7
5.	Non Network Options	7
6.	Network Options	8
6.	.1 Proposed Option to address the identified need	8
6.	.2 Option Considered but Not Proposed	8
6.	.2.1 Do Nothing	8
7.	Recommendations	8
a	References	٩

1. Introduction

The Woolooga Substation was established in 1973 to supply the Ergon and Energex loads in the Wide Bay zone, and to support Central to South Queensland power transfers. Woolooga Substation also includes an SVC, (located adjacent to the substation and commissioned in 2008). The SVC provides reactive power support for high Central to South Queensland power transfers.

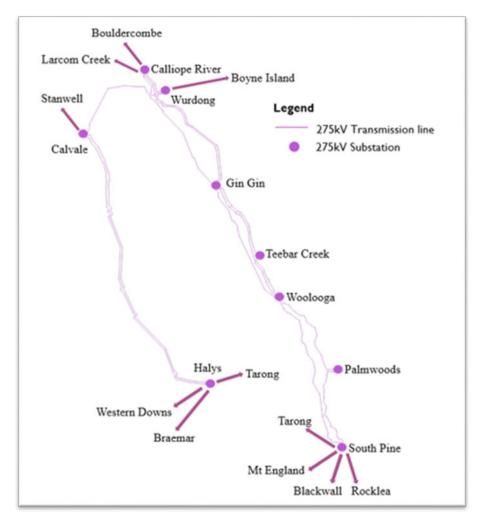


Figure 1-1: Woolooga locates on the CQSQ transmission corridor

A condition assessment of the 275 and 132kV secondary systems has determined they are approaching the end of their technical life and recommends that they be replaced by the end of the 2029.

This condition driver has triggered the need to assess the enduring network need for the Woolooga Substation configuration and function.

This report assesses the impact that removal of the functionality enabled by the secondary systems would have on the performance of the network and Powerlink's statutory obligations. It also establishes the indicative requirements of any potential alternative solutions to the current services provided by Woolooga Substation.

2. Woolooga Demand Forecast

The substation is comprised of two switchyards;

- The 275kV switchyard, which has feeders connecting to Gin Gin, South Pine, Palmwoods and Teebar Creek.
- 2. The 132kV switchyard, which provides 3 X 132kV connections to Ergon and 2 X 132kV connections to Energex for supply to Wide Bay, Gympie and North Coast Regions.

Figure 2-1 shows connection of Woolooga Substation to the South Pine, Palmwoods, Teebar Creek, Gin Gin and Calliope River Substations, by 275kV transmission circuits, as well as its connection to the Ergon and Energex networks in the Wide Bay area via two 275/132kV 250MVA transformers.

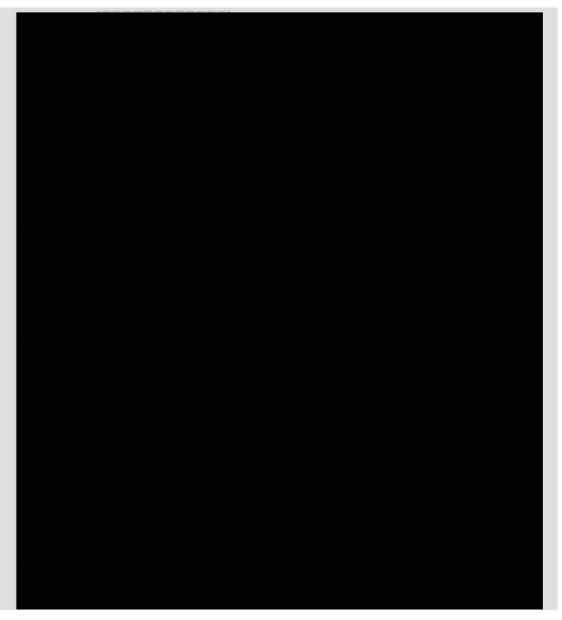


Figure 2-1: 275/132kV Woolooga Substation and SVC Electrical Single Line Diagram

Figure 2-2 shows that the Woolooga Substation supplies the loads at Kilkivan, Mungar, Gympie, Cooran, Noosaville, Sunrise Hill and QR Traveston.



Figure 2-2: Woolooga supply area

Figure 2-3 shows historical load duration curves for Woolooga Substation.

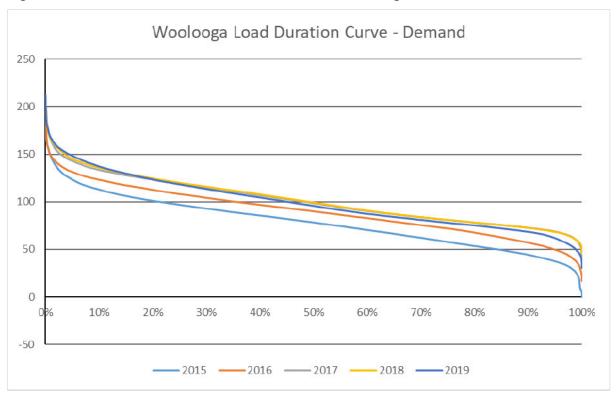


Figure 2-3: Load Curve for Woolooga 132kV

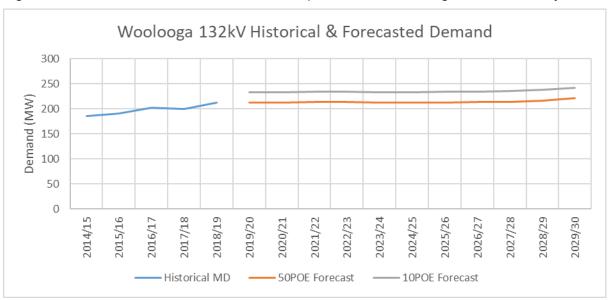


Figure 2-4 shows the historical and forecast of peak load at Woolooga in the next 10 years.

Figure 2-4: Woolooga 132kV Maximum Demand

Figure 2-4 shows the forecast summer maximum demand is not expected to change materially in coming years. The summer 10% PoE maximum demand is forecast to increase from 233.6MW in 2019/20 to 242.6MW in 2029/30. There are no major additional loads proposed or committed in the Woolooga area.

There is also significant interest from proponents wanting to connect inverter-based generators in the area surrounding the Woolooga Substation.

3. Statement of Investment Need

As outlined in Section 2, the Woolooga Substation is a major transmission node between Central and South Queensland, as well as an essential bulk supply substation to supply Ergon and Energex loads in the Wide Bay zone.

Removing the functionality of this substation would have a major impact on the performance of the CQ-SQ grid section as well as impacting the reliability of supply to the loads in the Wide Bay area (including loads at Kilkivan, Mungar, Gympie, Cooran, Noosaville, Sunrise Hill and QR Traveston).

The secondary systems are required to operate Woolooga Substation. Therefore, the secondary systems at Woolooga Substation is required to avoid system failures that would result in loss of load in excess of Powerlink's N-1-50MW / 600MWh reliability standard. There would also be significant impact to the capacity of the CQ-SQ grid section.

4. Network Risk

Table 4-1 presents the load at risk, as well as the energy at risk, at Woolooga 132kV.

Table 4-1: Load at Risk

Load At Risk	Contingency Event	Quantity	2020	2030
	Weeless Tetal	Max (MW)	240	250
Wl TCD	Woolooga Total	Average (MW)	116	117
Woolooga TCP Load	Secondary Systems	24h Energy Unserved Max (MWh)	3750	3804
	Outage	24h Energy Unserved Average (MWh)	2789	2819
		Max (MW)	20	21
William I and	F	Average (MW)	9	9
Kilkivan Load	Feeders 764 and 765	24h Energy Unserved Max (MWh)	332	339
		24h Energy Unserved Average (MWh)	207	208
		Max (MW)	9	9
Museum	ngar Load Feeder 7190 Average (MW) 24h Energy Unserved Max (MWh)		3	3
Mungar Load			115	120
		24h Energy Unserved Average (MWh)	64	67
		Max (MW)	214	224
Gympie, Traveston, Cooran,	 	Average (MW)	105	106
Noosaville and Sunrise Hill Load	Feeders 747 and 748	24h Energy Unserved Max (MWh)	3378	3402
		24h Energy Unserved Average (MWh)	2518	2544

5. Non Network Options

The Woolooga 275/132kV Substation facilitates 275kV flow between Central and Southern Queensland. The substation hosts two 275/132kV transformers to facilitate supply to Ergon loads between Woolooga and Teebar Creek and Energex loads located between Woolooga and Palmwoods.

To meet the Woolooga demand, the non-network solution must be capable to delivering up to 250MW of power and 3800MWh of energy each day. The non-network solution would be required to be capable of operating during a contingency or outage on a continuous basis until normal supply is restored.

As a result, no non-network alternatives are envisaged. Potential non-network solutions would need to provide supply to individual 132kV Woolooga loads, (as per the load at risk table), to reduce the scope of this project.

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

6. Network Options

6.1 Proposed Option to address the identified need

Planning recommends the replacement of all 275 and 132kV secondary systems at H005 Woolooga Substation by end of 2029. This option ensures that all reliability of supply and asset condition criteria is met as well as maintaining the power transfer capability between Central and South Queensland.

Further details of condition assessment for the Woolooga Substation secondary systems and their individual recommended replacement timing can be found in Reference 1.

6.2 Option Considered but Not Proposed

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

6.2.1 Do Nothing

"Do Nothing" would not be an acceptable option as the primary driver (secondary systems condition and obsolescence) and associated safety, reliability and compliance risks would not be resolved. Furthermore, the "Do Nothing" option would not be consistent with good industry practice and would result in Powerlink breaching their obligations with the requirements of the Technical Rules and its Transmission Authority.

7. Recommendations

Powerlink has reviewed the condition of the secondary systems at Woolooga Substation and anticipates they will reach end of technical service life by 2029. It is therefore recommended that the systems be replaced by December 2029.

Retaining Woolooga Substation will allow Powerlink to continue to meet its required reliability obligations (N-1-50MW/600MWh) and maintain power transfer capability between central and South Queensland.

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

8. References

- 1. H005 Woolooga Secondary Systems Condition Assessment Report 20 March 2020
- 2. Transmission Annual Planning Report 2020
- 3. Asset Planning Criteria Framework

Risk Cost Summary Report

CP.02392 Woolooga Secondary Systems Replacement

Version Number	Objective ID	Date	Description
1.0	A3395056	09/07/2020	Original document.

Version 1.0 Page 1 of 6

1 Purpose

The purpose of this model is to quantify the base case risk cost profiles for the secondary systems at Woolooga Substation which is proposed for reinvestment under CP.02392.

Base case risk costs have been analysed over a ten-year study horizon.

2 Key Assumptions

In calculating the potential unserved energy (USE) arising from a failure of the ageing and obsolete secondary systems at Woolooga Substation, the following modelling assumptions have been made:

- Spares for secondary system equipment items have been assumed to be available prior to the
 point of expected spares depletion, which coincides with the expected technical asset life. After
 this point the cost and time to return the secondary system back to service increases
 significantly;
- Historical load profiles have been used when assessing the likelihood of unserved energy under failure events;
- Due to the network and substation configuration, unserved energy generally accrues under concurrent failure events and consideration has been given to potential feeder trip events within the wider south west Queensland area;
- Woolooga Substation supplies a mixture of residential, commercial and agricultural loads.
 Historical load data and estimates have been used to analyse the proportion of these load types;
- VCRs for residential, agricultural and commercial load types within the relevant climate zone
 published within the AER's 2019 Value of Customer Reliability Review Final Report have been
 used within this risk cost assessment. A weighted average VCR of \$30,583/MWh has been used
 when evaluating network risk cost, derived from the proportions identified from historical data.

3 Base Case Risk Analysis

3.1 Risk Categories

Four main categories of risk are assessed within Powerlink's risk approach; safety, network, financial and environmental. For the secondary systems at Woolooga, network and financial risks are considered material and are modelled in the risk cost analysis.

3.2 Secondary Systems Analysis

This section analyses the risks presented by the relevant secondary systems at Woolooga Substation.

Table 1 - Risks associated with at risk secondary systems

	Mode of failure	
Equipment	Peaceful	Explosive
Secondary systems	Network risks (unserved energy due to concurrent network element outages).	N/A
	Financial risks to respond on- site and replace failed secondary systems in an emergency manner ¹ .	

¹ Secondary systems spares are modelled as being available until equipment reaches 20 years of age. After this time, the cost to replace obsolete spares in an emergency manner is higher which is modelled as increased financial risk cost.

Version 1.0 Page 2 of 6

3.3 Base Case Risk Cost

The modelled and extrapolated total base case risk costs are shown in the following figures.

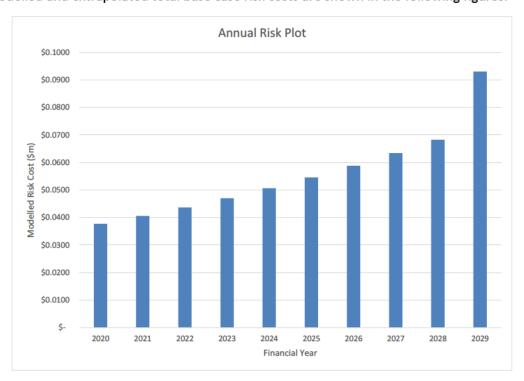


Figure 1 – Woolooga secondary systems total risk cost

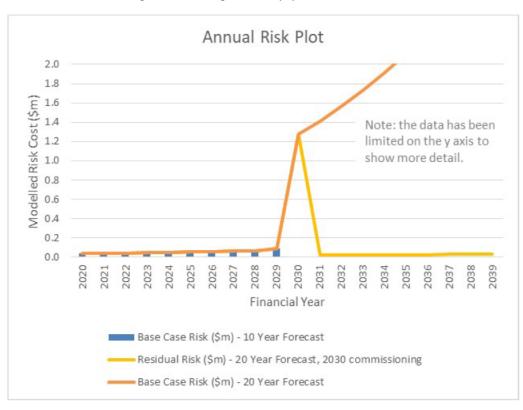


Figure 2 – Woolooga secondary systems risk cost (10 and 20 years)²

Version 1.0 Page 3 of 6

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² The significant increase in modified risk cost in 2030 coincides with the depletion of available spares (refer Section 4).

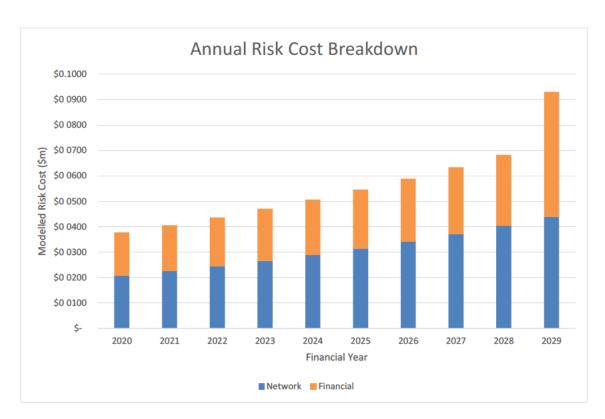


Figure 3 – Woolooga secondary systems risk cost by category

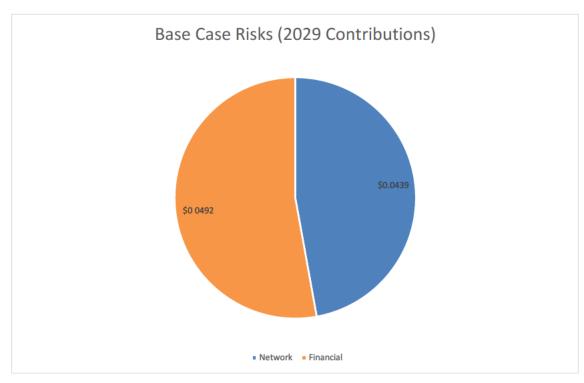


Figure 4 – Woolooga 2029 risk cost by category

Version 1.0 Page 4 of 6

3.4 Base case risk statement

The main base case risks for the secondary systems at Woolooga Substation are associated with financial risks to replace the failed secondary systems in an unplanned (emergency) manner, and network risks (unserved energy) resulting from concurrent network outages associated with equipment failures.

4 Participation factors

A sensitivity analysis was carried out 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 following figures.

As an example, the participation of VCR to risk cost post obsolescence is approximately 77.5%. Hence, an increase in VCR of 100% would increase the overall risk cost by around 77.5%.

Due to the non-linear nature of the risk cost model (specifically network risk costs which are a function of concurrent failures), the participation factor can change depending on the magnitude of input percentage change. The participation factors calculated below are based on an increase of input by 100%.

The following observations can be made:

- Pre-secondary systems obsolescence: the model is most sensitive to VCR followed by emergency replacement cost.
- Post-secondary systems obsolescence: the model is most sensitive to plant restoration time followed by VCR.

Item Value Unit VCR 30.583 \$/MWh Network Plant restoration time with spares 1 Day Plant restoration time with no spares Days Emergency replacement cost with spares 0.01 \$million **Financial** Emergency replacement cost with no spares 0.1 \$million

Table 2: Input values, secondary systems model

Version 1.0 Page 5 of 6

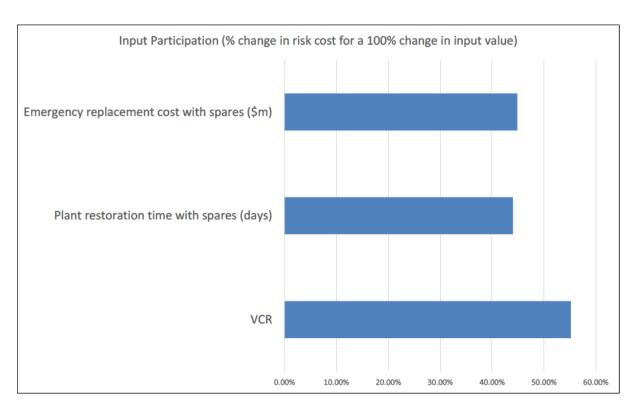


Figure 5-Participation factors, secondary systems model-pre secondary systems obsolescence

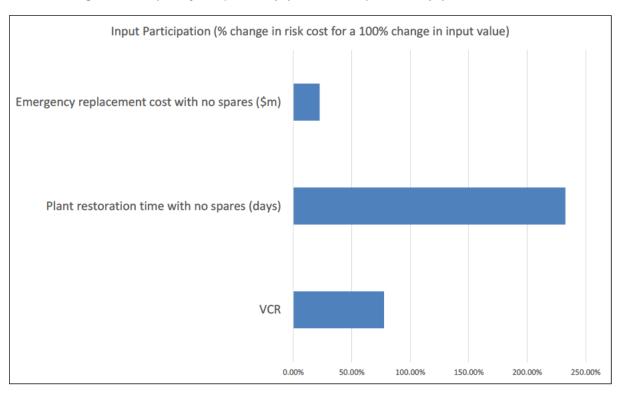


Figure 6 - Participation factors, secondary systems model – post secondary systems obsolescence

Version 1.0 Page 6 of 6

Project Scope Report CP.02392

Woolooga 275/132kV Secondary System Replacement

Concept - Version 1

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
20/04/2020		Project Scope Report CP.02392 Woolooga 275/132kV Secondary System Replacement	Preliminary scope

Related Documents

Issue Date	Responsible Person	Objective Document Name
20/03/2020		H005 Woolooga Secondary Systems Condition Assessment Report – 20 March 2020 (Obj ID: A3338686)

Project Contacts

Project Sponsor		
Connection & Development Manager	<name></name>	Ext.
Strategist – HV/Digital Asset Strategies	<name></name>	Ext.
Planner – Main/Regional Grid	<name></name>	Ext.
Manager Projects	<name></name>	Ext.
Project Manager	<name></name>	Ext.
Design Coordinator	<name></name>	Ext.
<delete if="" insert="" more="" needed="" or=""></delete>		

Project Details

1. Project Need & Objective

H005 Woolooga is a 275/132kV substation located approximately 165km north-west of Brisbane and was established in 1973 to assist with the CQSQ transfer. An SVC connected to the 275kV was established a separate switchyard in 2008.

The main substation is comprised of two (2) switchyards, as follows:

- a 275kV switchyard which has feeders connecting to Calliope River/Gin Gin, South Pine, Palmwoods and Teebar Creek; and
- a 132kV switchyard which has 3x132kV feeders connecting to Ergon and 2x132kV feeders connecting to Energex for supply to Wide Bay, Gympie and North Coast Regions.

The objective of this project is to replace the 275/132kV secondary systems at H005 Woolooga by 31st October 2029.

2. Project Drawings

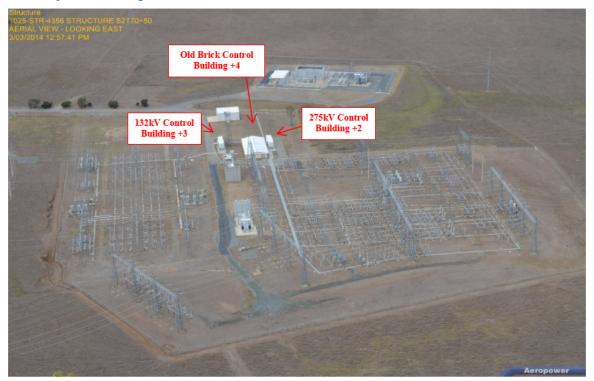


Figure 2-1 – 132kV/275kV Woolooga Substation and SVC Aerial View

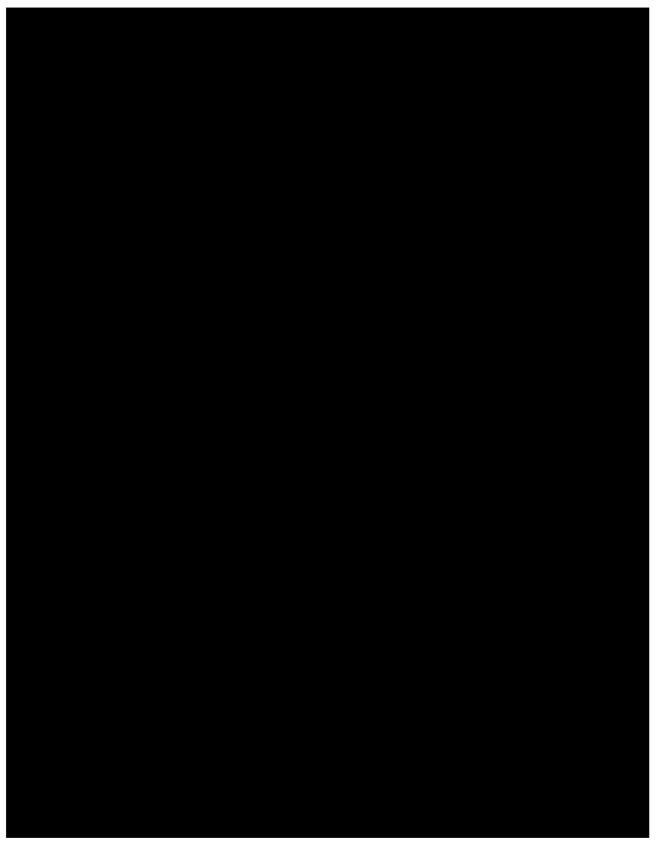


Figure 2-2 – 132kV/275kV Woolooga Substation and SVC Electrical Single Line Diagram

3. Project Scope

3.1. Original 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 5 Special Considerations*.

Briefly, the project consists of replacing the 275kV and 132kV secondary systems equipment at H005 Woolooga Substation utilising the spare space in the old brick control building. It should be noted that the replacement of the SVC secondary systems is to be carried out under a separate project CP.02810 'Woolooga SVC Secondary System Replacement'.

3.1.1. Transmission Line Works

Not Applicable.

3.1.2. H005 Woolooga Substation Works

Design, procure, construct and commission the following items:

Refurbishment of the old brick control building +4 to meet current Powerlink standards including, but not limited to:

- upgrade of air conditioning, if required;
- upgrade of AC supplies, if required; and
- upgrade of cable entries, if required.

From Building +2:

- Replacement of all 275kV secondary systems in the following panels utilising the spare space within the old brick control building +4 (currently empty):
 - o 275kV Bus Zone 1;
 - 275kV Bus Zone 2;
 - C01 275kV Bus Coupler 1;
 - o C01 275kV Feeder 813/815 Calliope River Tee Gin Gin;
 - C02 275kV Bus Coupler 2;
 - C02 275kV Feeder 807 South Pine;
 - C02 275kV Feeder 814 Calliope River Tee Gin Gin;
 - C03 275kV Bus Coupler 3;
 - C03 275kV Feeder 810 Palmwoods;
 - C03 275kV Feeder 8850 Teebar Creek;
 - C04 275kV Bus Coupler 4;
 - C04 Transformer T5 (275kV);
 - C05 275kV Bus Coupler 5;
 - C06 275kV Capacitor Bank 3;
 - C07 275kV Bus Coupler 7;

- o C07 Transformer T3 (275kV); and
- o C07 275kV Static Var Compensator 4.
- Replacement of 125V DC X & Y DB, Batteries, Battery Charger and Cubicle.
- Replacement of NSC/LCF, Common RTU, OPSWAN and associated panel.
- Replacement of GPS Clock.

From Building +3: -

- Replacement of all 132kV secondary systems in the following panels utilising the spare space within the old brick control building +4 (currently empty):
 - 132kV Bus Zone 1;
 - 132kV Bus Zone 2:
 - D02 132kV Feeder 764 Kilkivan
 - D03 132kV Feeder 765 Kilkivan;
 - D04 Transformer T5 (132kV);
 - D05 132kV Bus Coupler;
 - D11 132kV Capacitor Bank 2;
 - D12 132kV Capacitor Bank 1;
 - D14 132kV Feeder 7190 Mungar;
 - D17 Transformer T3 (132kV);
 - D18 132kV Feeder 748 Cooroy Tee Gympie; and
 - D19 132kV Feeder 747 Traveston Tee Gympie.
- Replacement of 125V DC X & Y DB, Batteries, Battery Charger & Cubicle.
- Replace all Revenue Metering equipment and panel based on current standard.
- Replacement of NSC/LCF, Common RTU, OPSWAN and associated panel.
- Replacement of Power Quality Monitoring panel.
- Replacement of GPS clock.

Associated switchyard civil works including new cable termination racks across trenches, cable trenches and cable termination kiosks as appropriate.

Installation of new cables from the cable termination racks to the newly installed panels in the old brick control building +4.

Decommission and recover all redundant equipment, and update drawing records, SAP records, configuration files, etc. accordingly.

3.1.3. Substation Works – Remote Ends

Minimal works are planned for the remote ends. The scope is limited to minor works including adjustment to CT ratios and protection settings consequential to the replacement of secondary systems in the selected bays at Woolooga.

3.1.4. Telecoms Works

Not applicable.

3.1.5. Easement/Land Acquisition & Permits Works

Not applicable.

4. Project Timing

4.1. Project Approval Date

The anticipated date by which the project will be approved is 31 October 2026.

4.2. Site Access Date

H005 Woolooga is an existing Powerlink operational substation and access to the site is immediately available.

4.3. Commissioning Date

The latest date for the commissioning of the new assets included in this scope <u>and</u> the decommissioning and removal of redundant assets, where applicable, is 31 October 2029.

5. Special Considerations

Not applicable.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Investment & Planning.

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

7. Asset Ownership

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

8. 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.

9. Options

Not applicable.

10. Division of Responsibilities

A division of responsibilities document will be required to cover the changes to the interface boundaries with Energy Queensland. The Project Manager will be required to draft the document and consult with the Project Sponsor who will arrange sign-off between Powerlink and the relevant customer.

11. Related Projects

Project No.	Project Description	Planned Comm Date	Comment
Pre-requisit	e Projects		
Co-requisite	e Projects		
Other Related Projects			
CP.02810	Woolooga SVC Secondary System Replacement	31 Oct 2029	





Version: 1.0

Concept Estimate for CP.02392 - Woolooga 275/132kV Secondary Systems Replacement

Record ID	A3372053	
Policy stream	Asset Management	
Authored by	Project Manager	
Reviewed by	Project Manager	
Reviewed by	Team Leader	
Approved by	Manager Projects	

Current version: 14/09/2020		Page 1 of 13
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ASM-FRM-A3372053

Replacement



Concept Estimate for CP.02392 - Woolooga 275/132kV Secondary Systems

Version: 1.0

Contents

1.	Exe	cuti	ve Summary	3
•	1.1	Proj	iect Estimate	3
•	1.2	Proj	iect Financial Year Cash Flows	4
2.	Proj	ject	and Site Specific Information	4
2	2.1	Proj	iect Dependencies & Interactions	4
2	2.2	Site	Specific Issues	4
3.	132	/275	kV Secondary Systems Replacement	4
;	3.1	Def	inition	4
	3.1.	1	Scope	4
	3.1.	1.1	H005 Woolooga Substations Works	6
	3.1.	1.2	Transmission Line Works	8
	3.1.	1.3	Telecommunication Works	8
	3.1.	1.4	Easement/Land Acquisition & Permit Works	8
	3.1.	2	Major Scope Assumptions	8
	3.1.	3	Scope Exclusions	9
;	3.2	Proj	iect Execution	10
	3.2.	1	Project Schedule	10
	3.2.	2	Network Impacts	10
	3.2.	3	Project Staging	11
	3.2.	4	Resourcing	11
;	3.3	Proj	iect Estimate	12
;	3.4	Proj	iect Financial Year Cash Flows	12
;	3.5	Proj	iect Asset Classification	12
4	Refe	eren	CPS	13

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Current version: 14/09/2020		Page 2 of 13





Version: 1.0

1. Executive Summary

This concept estimate has been developed on the basis of the CP.02392 – Woolooga 275/132kV Secondary Systems Project Scope Report (PSR) – Version 1, (Objective ID: A3345045).

The H005 Woolooga Secondary Systems Condition Assessment Report – 20 March 2020 (Obj ID: A3338686, dated 20 March 2020) has been referenced for the development of this concept estimate.

H005 Woolooga is a 275/132kV Substation located approximately 165km north-west of Brisbane and was established to assist with the electricity transfer between the central and southern regions. The main substation is comprised of a 275kV switchyard and 132kV bays sharing a common perimeter fence.

There are 10 supplies to remote ends that will require integration with the new secondary system at H005 Woolooga under this project. The 275kV feeders connect to the Powerlink substations and the Woolooga Static Var Compensator (SVC) and the 132kV feeders connect to Energy Queensland substation. For the purpose of this estimate, all works at the H005 SVC site is included as a remote end.

A recent secondary systems condition assessment report indicates that the secondary systems is reaching the end of its technical asset life and requires replacement.

As indicated in the Project Scope Report, the target commissioning date is October 2029. To achieve the scope of works with minimal network and load at risk issues, the project design will need to commence in 2025 to achieve the required network outages, that will be completed during the 2027 to 2029 winter and shoulder months. A revised project approval date of June 2025 and a project commissioning date of December 2029, are proposed.

The objective of this project is to replace and relocate the 275/132kV secondary systems into the existing brick control room at H005 Woolooga by the target commissioning date of December 2029.

1.1 Project Estimate

Estimate Components		Base \$	Escalated \$
Estimate Class	3		
Estimate Accuracy	+ 30% / - 20%		
Base Estimate		26,799,956	37,516,088
Mitigated Risk			
Contingency Allowance			
TOTAL			

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Current version: 14/09/2020		Page 3 of 13



Version: 1.0

1.2 Project Financial Year Cash Flows

Cash Flow Table	June 2020 Base Date	Completion
To June 2025	8,805	10,764
To June 2026	227,803	289,910
To June 2027	5,789,293	7,669,740
To June 2028	8,428,997	11,624,700
To June 2029	8,990,383	12,907,281
To June 2030	3,354,675	5,013,693
TOTAL	26,799,956	37,516,088

2. Project and Site Specific Information

H005 Woolooga is a 275/132kV Substation located approximately 165km north-west of Brisbane and was established in 1973 to assist with the electricity transfer between the Central/Southern Regions.

An SVC connected to the H005 Woolooga 275kV Substation was established in a separate switchyard in 2008

2.1 Project Dependencies & Interactions

The project dependency and interactions will be confirmed during the definition and concept stages.

2.2 Site Specific Issues

H005 Woolooga is a 275/132kV Substation located approximately 165km north-west of Brisbane on the Wide Bay Highway and 25km from Gympie CBD.

An SVC connected to the 275kV was established a separate switchyard in 2008.

Minor Secondary systems works only is expected to integrate the remote end substations with the new H005 secondary systems.

3. 132/275kV Secondary Systems Replacement

3.1 Definition

3.1.1 Scope

The option proposed in this estimate is for the replacement and relocation of the 275kV and 132kV secondary systems equipment at H005 Woolooga Substation into the existing original brick control building +4.

The estimate includes the refurbishment of the existing brick control building +4 to meet current Australian / Powerlink standards including air conditioning, fire detection systems, security system and WHS facilities and requirements.

The decommissioning, removal and disposal of the redundant secondary systems control cabling, control panels and control buildings +2 and +3 including support structures to foundation level are included.

	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland
Current version: 14/09/2020		Page 4 of 13



ASM-FRM-A3372053

Version: 1.0

Concept Estimate for CP.02392 - Woolooga 275/132kV Secondary Systems Replacement

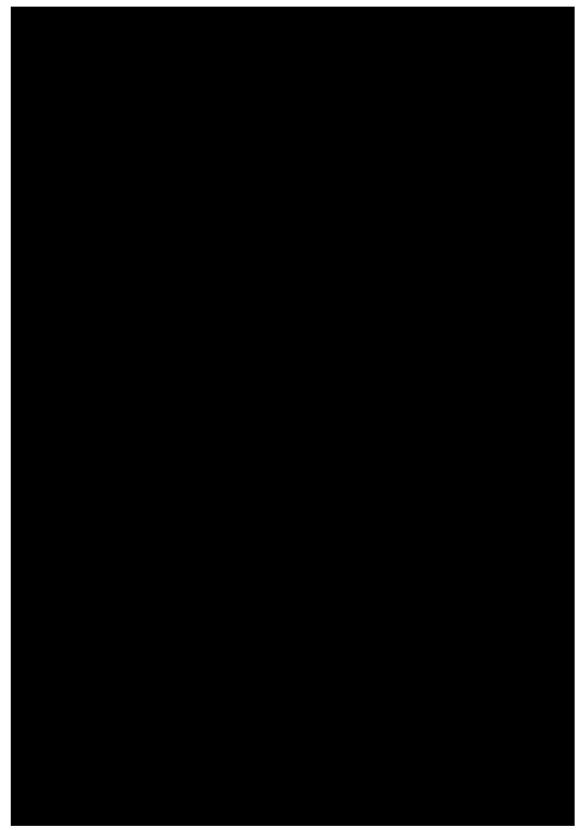


Figure 3-1: 132kV/275kV Woolooga Substation and SVC Electrical Single Line Diagram

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Current version: 14/09/2020		Page 5 of 13





Version: 1.0

3.1.1.1 H005 Woolooga Substations Works

The scope of works at H005 Woolooga are:

Civil works including minor cable trenches and new external cable termination rack enclosures and cable pits.

Refurbishment of the old brick control building +4 to meet current Powerlink standards including upgrade / replacement / integration of:

- air conditioning;
- AC supplies;
- secondary systems control cable entries to wall entry;
- floor mounted cable tray arrangement;
- the fire detection systems;
- the security system; and
- WHS requirements.

Design, procure, construct and commission the following items:

From Building +2:

- Replacement of all 275kV secondary systems in the following panels:
 - Bus Zone 1 & 2;
 - Bus Couplers;
 - Feeder 813/815 Calliope River Tee Gin Gin;
 - Feeder 807 South Pine;
 - Feeder 814 Calliope River Tee Gin Gin;
 - Feeder 810 Palmwoods;
 - Feeder 8850 Teebar Creek:
 - Transformer T5 (275kV);
 - Capacitor Bank 3;
 - Transformer T3 (275kV); and
 - Static Var Compensator 4.

From Building +3:

- Replacement of all 132kV secondary systems in the following panels:
 - Bus Zone 1 & 2;
 - Feeder 764 Kilkivan;
 - Feeder 765 Kilkivan;
 - Transformer T5 (132kV);
 - Bus Coupler;
 - Capacitor Bank 1 & 2;
 - Feeder 7190 Mungar;
 - Transformer T3 (132kV);
 - Feeder 748 Cooroy Tee Gympie; and

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Current version: 14/09/2020		Page 6 of 13





Version: 1.0

- o Feeder 747 Traveston Tee Gympie.
- Replacement of 125V DC X & Y DB, Batteries, Battery Charger & Cubicles;
- Replace all Revenue Metering equipment and panel based on current standard;
- Replacement of NSC/LCF, Common RTU, OPSWAN and associated panel;
- Replacement of Power Quality Monitoring panel;
- Replacement of GPS clock.
- Installation of new 275/132kV control panels into control building +4;
- Installation and termination of new control cables from the panels in control building +4 to the external cable termination rack enclosures; and
- Cutover bays to new control system:
 - All existing panels located within buildings +2 and +3 shall be decommissioned, redundant secondary systems cabling and control buildings +2 and +3 to be removed from site.

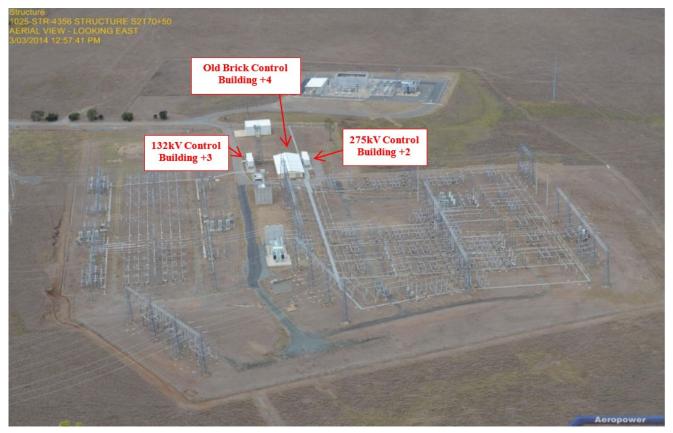


Figure 3-2: 132kV/275kV Woolooga Substation control room arrangement

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Current version: 14/09/2020		Page 7 of 13

Version: 1.0



Figure 3-3: 132kV/275kV Woolooga Substation proposed termination rack locations

3.1.1.2 Transmission Line Works

Not applicable.

3.1.1.3 Telecommunication Works

Minor telecommunication works is expected for the cutover works.

3.1.1.4 Easement/Land Acquisition & Permit Works

Not applicable.

3.1.2 Major Scope Assumptions

It is assumed that:

- For the purpose of this estimate, the secondary systems asset boundary between the H005 substation and SVC yard will be at the 275kV terminal rack.
- The existing Control building +4 is structurally and mechanically deemed 'fit for purpose' and cost effective to upgrade up to Australian and Powerlink Standards
- The existing brick building work includes replacement of the air conditioning to meet the cooling requirements of the new control equipment.
- The proposed side entry of the control cable through the walls / window of the +4 buildings is approved.
- The control panels will be built and point to point (P2P) tested at the vendors premises before sent to site for contractor to integrate and wire to new termination racks.
- Existing field cable are fit for purpose and can be re-used and re-terminated into the new cable termination rack enclosures panel.
- All new foundations will be a high level design.
- Minor Asbestos works is required and an allowance is included in the estimate.

	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland
Current version: 14/09/2020		Page 8 of 13





Version: 1.0

- An outage on QR Feeder 7190 will be difficult and early negotiation with network operations will be required.
- It is assumed that Energy Queensland resources will be available when required to complete works at the remote ends.
- There are no Energy Queensland projects that may impact on the Powerlink schedule of works.
- Estimate is based on Powerlink architectures, standards and equipment in place and available at the time of development.
- An approved safe work method has been approved for works in confined spaces for the removal of any redundant new secondary systems cabling.

3.1.3 Scope Exclusions

- All Internal segregations / walls in control building +4.
- All works to secure closure of the cable basement at the completion of the project.
- Rock is excluded from the base estimate (an item is included in the risk).
- The addition of more renewable generation in the region is likely to create less favourable outage requirements. These have not been considered or any allowance included.
- This estimate does not include any costs for repairing or modification to primary plant.
- The estimate excludes upgrades for the following: earth grid, internal roads, lights, fences and gates.
- No modification on the existing transmission lines are considered in this estimate.
- No time allowance is included in the project schedule for any Energy Queensland projects that may impact Powerlink schedule of works.
- The Project Scope Report does not indicate the replacement of the 50VDC battery system. The cost for the battery system is included as project risk.
- Any works for the Replacement of the SVC secondary systems. It will be completed under a separate project CP.02810 'Woolooga SVC Secondary System Replacement'.

Current version: 14/09/2020		Page 9 of 13
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Version: 1.0

3.2 Project Execution

3.2.1 Project Schedule

A High Level Project Schedule should be developed and should address the following project stages:

Task	Target Completion
Project Approval, PAN Issued	June 2025
Contract Award	October 2025
Design Commencement	October 2025
Procurement Orders	November 2025
Site Access Date	February 2026
Control Building (+4) Upgrades	February 2026
Civil works and Cable termination rack works	February 2026
Staged 275kV Bay Commissioning	March 2027
Staged 132kV Bay Commissioning	June 2028
Staged Bus Commissioning	October 2029
Final Commission Notice	October 2029
Final Decommissioning	December 2029
Project Practical Completion	December 2029

3.2.2 Network Impacts

- Outages to be scheduled in shoulder and winter periods Late April/ May to October.
- Outage on QR Feeder 7190, will be difficult and early negotiation with network operations will be required.
- Detailed Restoration plans for every outage.

Current version: 14/09/2020		Page 10 of 13
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Version: 1.0

3.2.3 Project Staging

The proposed staging for the CP.02392 project works is to be completed in multiple individual stages.

Contractor to complete +4 control building upgrades

Contractor to complete civil works and installation of outdoor cable terminal rack enclosures and install new secondary systems cables

MSP to witness point to point testing of the new control panels with vendor

Contractor to install new control panels and battery into control building +4

Contractor handover to MSP

MSP - 275KV cutover to new control panels in control building +4

MSP -132kV cutover to new control panels in control building +4

MSP - 275kV bus cutover

MSP - 132kV bus cutover

MSP - Final commissioning of new 275/132kV secondary systems

Contractor to decommissioning and removal of all redundant cables, panels and control buildings +2 and +3

Project Post Commissioning and Drawing Management

3.2.4 Resourcing

Resources for the project will be a combination of the design works and will be completed by external design partners with reviews conducted by internal Powerlink design staff. The construction works will be completed by a combination of the Maintenance Service providers and Substation Panel contractors.

		HARDCOPY IS UNCONTROLLED	© Powerlink Queensland
(Current version: 14/09/2020		Page 11 of 13



Version: 1.0

3.3 Project Estimate

Estimate Components		Base \$	Escalated \$
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Estimate Accuracy	+ 30% / - 20%		
Base Estimate		26,799,956	37,516,088
Mitigated Risk			
Contingency Allowance			
TOTAL			

3.4 Project Financial Year Cash Flows

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To June 2030	3,354,675	5,013,693
TOTAL	26,799,956	37,516,088

3.5 Project Asset Classification

Asset Class	Asset Life	Base \$	Percentage
Secondary systems	15 years	22,573,489	84%
Communications	15 years	910,168	3%
Primary plant	40 years	3,316,298	12%
Transmission lines	50 years		
TOTAL		26,799,956	

Current version: 14/09/2020		Page 12 of 13
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ASM-FRM-A3372053

Version: 1.0

Concept Estimate for CP.02392 - Woolooga 275/132kV Secondary Systems Replacement

4. References

Document name	Version	Date
Project Scope Report	1.0	20/04/2020

Current version: 14/09/2020		Page 13 of 13
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