POWERLINK QUEENSLAND DRAFT REVENUE PROPOSAL

PROJECT PACK – PUBLIC

CP.02392 Woolooga Secondary Systems Replacement

2022/23 – 2026/27 REGULATORY PERIOD

SEPTEMBER 2020







H005 Woolooga 275kV SVC 132/275kV Substation

Secondary Systems Condition Assessment Report

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Table of *Contents*

1.	Introduction	ა
2.	Inclusions and Exclusions	7
2	2.1 Inclusions	7
2	2.2 Exclusions	7
3.	Condition Assessment Principles and Methodology	8
4.	Buildings	9
4	I.1 Substation Secondary Systems Buildings	9
4	I.2 SVC Control Building	
5.	Condition Assessment	.11
5	5.1 Secondary System Outdoor Marshalling Kiosks	.11
5	5.2 Outdoor Secondary System Cables	.16
5	5.3 Indoor Termination Racks / Yard Interface Cubicle	.17
5	5.4 Indoor Secondary System Cables	.17
5	5.5 Control and Protection Systems	.17
	5.5.1 Secondary Systems Panels	.17
	5.5.2 Control, Protection, Auxiliary, Ancillary, Metering and OpsWAN Equipment.	.22
	5.5.2.1. Control, Protection, Auxiliary, Ancillary Equipment	.22
	5.5.2.2. Revenue Metering Panels	.24
	5.5.2.3. Revenue Metering Equipment	.24
	5.5.2.4. OpsWAN System Panels	.24
	5.5.2.5. OpsWAN Equipment	.25
	5.5.3 Auxiliary Supply	
	5.5.3.1. AC Auxiliary Supply	.26
	5.5.3.2. DC Batteries and Chargers	.26
6.	Conclusion	
7.	Attachments	.28
8.	References	.29
9.	Appendix 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, and
- 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. Woolooga Substation and SVC primary equipment bays include:

Substation:

	Table 1 -	Woolooga	Substation Net	work Element	S
Lo	cal Substa	ation (H005	Woolooga SV	C)	Remote Substation
	Voltage (kV)	Quantity	Bay Designation	Operational Element	
Feeders	275	6	=C01-Q20, - Q30	813/2	Calliope River Tee Gin Gin
			=C02-Q10, - Q30	807	South Pine
			=C02-Q20, - Q30	814/2	Calliope River Tee Gin Gin
			=C03-Q10, - Q30	810	Palmwoods
			=C03-Q20, - Q30	8850	Teebar Creek
			=C07-Q10, - Q30	584 (SVC)	
	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	<u>.</u>
Banks	132	2	=D11-Q10	Cap 2	
			=D12-Q10	Cap 3	
Reactors		0			





Transformers	275	3	=C07-Q20, -	3 Transf	
			Q30		
			=C07-Q10, -	4 Transf	
			Q30	(SVC =M04)	
			=C04-Q20, -	5 Transf	
			Q30		
	132	2	=D17-Q10	3 Transf	
			=D04-Q10	5 Transf	
Busbars	275	2	=KC1	1 Bus	
			=KC2	2 Bus	
	132	2	=KD1	1 Bus	
	132	2	=KD2	2 Bus	

SVC:

	Table 2 -	Woolooga	SVC Network	Elements	
Loc	al Substat	ion (H005	Woolooga SVC	;)	Remote Substation
	Voltage (kV)	Quantity	Bay Designation	Operational Element	Substation
Transformer	18.0/ 275 kV	1	=C07-Q10, - Q30	4 Transf (SVC =M04)	
Reactors	18.0	1	TCR1	TCR 1	
Capacitor Banks	18.0	5	TSC1 TSC2 HF5 HF7 HF11	TSC 1 TSC 2 5 th Filter 7 th Filter 11 th Filter	
Busbars	18.0	1		SVC LV Bus	



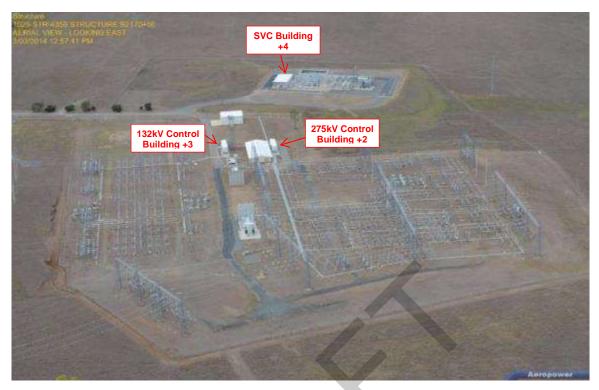


Figure 1 – 132kV/275kV Woolooga Substation and SVC Aerial View



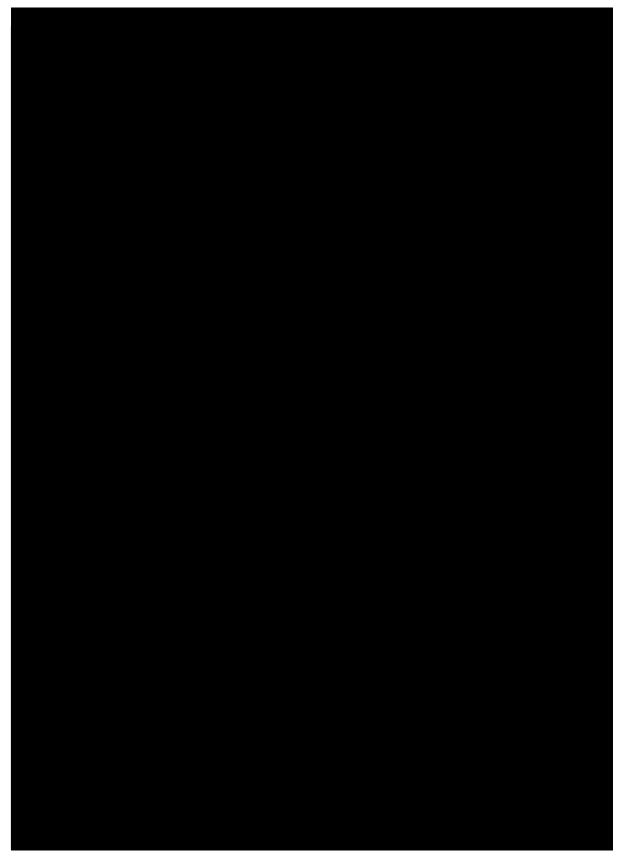


Figure 2 – 132kV/275kV Woolooga Substation and SVC Electrical Single Line Diagram

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



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.

H005 275/132KV WOOLOOGA SUBSTATION AND SVC

- 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,

2. Inclusions and Exclusions

- 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.

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.

Tab	ole 3 – Woolo	oga 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 System Building +2	+2 (275kV)	Sec Sys Bus =KC1, =KC2 Sec Sys Bays =C01, =C02, =C03, =C04, =C05, =C06, =C07	5
Substation Secondary System Building +3	+3 (132kV)	Sec Sys Bus =KD1, =KD2 Sec Sys Bays =D02, =D03, =D04, =D05, =D11, =D12, =D14, =D17, =D18, =D19 Revenue Metering Power Quality Monitoring	8
=M04 SVC Building +4	+4	SVC Sec Sys, Thyristor Valves and Valve Cooling	Spare capacity not measured
Work shed	+5	Maintenance Workshop	N/A









(a) Empty (Brick) Control Building +1







(b) 275kV Demountable Control Building +2







(c) 132kV Demountable Control Building +3





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 **Appendix A**. 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





(d) =C02-A30 Bay Marshalling Kiosk



(e) =C04-A20 Bay Marshalling Kiosk



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







(a) =D07-A91 Bay AC Marshalling Kiosk





(b) =D07-A92 Bay DC Marshalling Kiosk





(c) =D15-A91 Bay AC Marshalling Kiosk





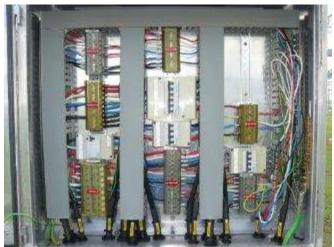


(d) =D15-A92 Bay DC Marshalling Kiosk









(f) =C04-A91 Bay AC Marshalling Kiosk

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





(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.







Bay: =D14-Q10

Bay Coupler: =D05-Q10

Bus: =KD1 & =KD2







Cap: =D11-Q10

Transformer=D04-Q10

Multiplex





Power Quality Monitoring

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







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





Multiplex

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

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



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 +2 Chargers - 2010)





(Buildings +3 Chargers – 2009)





(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

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

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



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.





9. Appendix A

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DTMR (DDW -017)	SURVINE - DST-CHI S TRANSFORMER IV	+300	29	CO 3.1	# MOOS-AND-AND-SANCORE	REMOTE TERMINAL UNIT FOURORD CND	POWRORS	(10	Yes					10.71	1,17				3.54	3.14	F3044	3026/30 M	1-30mm	>30HH
	COMCLE			1	HOSP TOO GET THEFT	ENLAY CRIMONT ON OND DIRECT BY PROPAGES; BELAY CRIMON SEL-MO-1 CIAL	SOMMETTERS	Service and	Yes	10.00	5.38	10.00	1000		100		_				1.0.00		S. A. Pett	
TS THREE CLIEBY FOOR	SANCENT - DOM-CODE TEAMS/COMMOR IN	1988	- 10	MO 43		BEACH THIMNAL UNIT FORDIO CHI	HORSONS.	CHO CHO	Yes	-	-	30.81	6.07	1014	5.11	_	_	-	814	339	>2044	2000/30 84	> 1046	> 3884
	OWOE		11.	11.	9005 SUS-445-1019CT	BELAY CO MIGNET GE CHO IN IN 2 SELFRONWARE)	GE	G60 (VS R.2.30)	Yes	10.60	5.26				-									
				4	9965-555-445-1996Y	RELAY CEMAN SEL-651-5 (14)	SOWETER	301-301-70M	Yes			10.14	5.12						1	37 29				_
I CAPTORRY - BLD	SSENS BAY - DLD-G16-CAFACTED BANK ARCC IS AND YIPROTECTION CURRELE.	1340	36	M 3.1	A MICH SOLVET PREZIDE.	BRING'S SHIMBALL LINE SCHOOL CALL	POSTUDIO	CHO	Ter					18.69	5.04		_	_	3.14	3.14	× 2044	3035/30-01	N-2044	+ 3544
	SCARGO FIRED CHI, NOR COURLESS.				HIROS COS ART PERMITY HIROS COS ART PROCET	BRAY OF BALLOWING MITCHISH STOR	AND	SPATROCER	No.	11.00	9.26			11.07	2.00		-	-	-	l .				1
					HOUSE COST 481 - MPROT	BELAY CAP PROTIN ABBSPACEOUS	AND	SPACEOC	No	12.45							-	-	1	l .				1
					N005-055-481-409037	FELAY CD MIGHT GC CDC IVER 2.20 FRIMWARD	60	CS0 (VTR 2.30)	Yes	111.60	5.38							_	1	l .				1
					MIROS-050-481-YPROY	RELAY TRE MONITORING RNS 3420K20	MACE	3A19636	Yes	777		15.99	5.00											1
				_	HIGH-555-481-9990T	BRIAY CRIMAN IPI-1915-1 CIAL	SCHWEITER .	301-001-101A1	Yes			35.44	5.24											
5 C% (3100A M0.1)	EXAM BUT THE CREATION BANK WITH	+1401	- 38	(a)		NEAR IN THROWING UNIT HOUSERS CAN	HOLICEU	Cio	Yes					01.44	5.05				1.54	9.94	F 20M	366/80-93	> 1044	+3866
	KAND THROTECTOR CORCLE				HR65 SUE-481 - POWKEE	RELAY FOW 15 CONTROLLER MITSUREM ETCH	MISSOSIE	SI CONTROLLER	- No.	100				TLAS.	6.81			-	1	l .				1
					9805-550-461-47907 9805-550-461-47907	FELAY OC B ET ADE SPACIONE ETLAY CAP PROTES ASSISTACIONE	AND	SPA/SARC SPA/SARC	No.	13.49	534	-		\rightarrow	-	-	-	_		l .				1
					#005-335-481-49907	BRIAY CA MICHIGAN COLONY & STEPHAWARES	Gr.	CNO DVER 2 SW	Tes	13.90	536					_	-	_	1	l .				1
					#008-509-281-9990Y	BRAY CHARACTEL BUT TOTAL	SCHWHITZEN	STL-SYL-LULAL	THE	1100	1000	ines	9.36											
WC HMT	THE MAIN PARK.	HM	- 34	100 3.0	SE - COOK SEEL SELVE AD LITTLE TO	BRUAY BALLED CONTART OF THE CONTACT	A.000	881 9.23	Yes					11.18	5.60				3.00	2.10	> 2068	2000/300 (64	>1044	> 3068
					MINOS 555-419Y-69YT	BUCTIONS VOLTAGE TRANSPOSES ASSENSE	MR	DOWN TO LOS	No						3.10		_	_		l .				1
					MM05-355-45WC-HM4	LOCAL CONTROL FACILITY PC & TERMINAL	WYSE:	2987	Yes .					4.14	2.45		2.5	1 196					l. J	1
WE PROTECTION (HEALT)	INC 184-1 PROTECTION AWARE		-	-	MINOS SSS-43YC-CRONTWE	CHECKFORT LINN PS PRODUDAPPLANT	CHECKPOINT	*****	700	11.00	5.60	-	-	\rightarrow	-	-	- 2	1.06			- 7041			
are require raine (save r)	THE THE PERSON NAME.	+68.5	100	100 14	HOSE SIGNATURE TRANSPROF	THE PRESENCE OF THE PRINCIPLE OF T	A40	RET 923 RK SERVICE AA	1	31.38	9.50								441	0.49	> 2011	2000/39-84	F3944	>360
					HOOK SID-SINC TRANSPOOL	DVC TREF LIBER	Ass	19810	No	31.38	6.54								1					I
			Ш	ш	WOOS SEE-REVO TREMPROT	TEST EWITCH MODULE 1	Alte	679724	No	13.30	5.50													1
			ш		MIKE SUS-41VC TRESPECT	TEST SWITCH MODULE 3	ANE	ETIOSH .	.560	11.00	5.88													
	No. of the Control of	,00	-	-	9905-353-45VC/TW/KPBOF	HOCKOOT INST	AMI	I/O UNIT	1 2	11.10	5.58	1000					-	-	1	S		1000	-	
W. PROTECTOR (PRE.E)	INC HE I PROTECTION NAME.	+108.5		100 3.4	HOSE COLLEGE TRANSPORT	PRIATE BASED CHIT ARE RETAZI, TRANSPORMER SAMES UNIT	ANG	SK SKYCKS AA	Yes			11.10					-	-	341	3.40	> 3041	3000/29-04	×1043	+ 2045
					WHOS-SEE 45YC-TRP9WIGT	DAC LINE COURT	ASS	DOMES	No			11.16					-	_	1	l .				1
			Ш.,		MINISTERS ASSESSMENT TREVERIOR	TEST SWITCH MODULE	A00	1-cepts works	2			11.18	5.59											
ZZSKY SKAMETER (2756V BAY CRS-QUE BUS QUURSES XAND Y	4395	- 38	KB (5.1	A 1605-005-591-8A/COMP.	REMOTE TERMINAL UNIT FOXBORD CSO	TOMBORD	C50	701		5.5		1000	DOM	5.44				3.14	3.34	× 2044	305/9/88	> 2004	>3664
DOMESTS.	PROTECTION CURICLE				9605-355-501-4990T	BELAY CO-MONEY OF CHE (VER J. BE PROMISED)	No.	ORIGINAL THE	Tes	19.86	5.44		200		1111					[D2000]	9900	12.00	5000	17-17
THEO TESTING (FORM BAY DELICITE BUT COLUMN A AND Y	4,250	-	- C	MORNING STREET	REAVERMENT OF META, 120/00, 60	SCHWEITING	191-912 (13) (316	Yes	-		man	5.44	20.00	2.74		-	-	414		+2004	2000010171	5.7000	3.700
CONTRACTOR OF THE ST	PROTECTION CHECK BUT COURSES AND Y	1,000	100	1 67	# MIGS-SIG-SHI-SHICONT MIGS-SIG-SHI-SHICOT	REMOTE TERMINAL UNIT POSSIONE CENT RELAY CO MIGHT DE COO IV DE 1 RE FRANÇANDO	FOREIGNO OF	G80 (VEN 2-9%	Tec	18.77	5.00			8477	4.00		-	-	8.16	111	F-2018	sowned.	9-20 44	7386
2200			Ш.,	J.	WINDS SIGNAL WINDS	FELAY CE INGMESTED 360 TA, LESVICE-MA	SOMMETERS.	060 DEC (\$40 (40))	- 100	1000		1077	5.74					-	1		الردووب			
PREV GLABETTER 1	2759V SAY COS-QUE WAS CORUPLED & AND Y	<2853	70	et 1.		REMOTE TERMINAL UNIT FOXBORD CSD	POWROED	(50	Yes			1000	1	10.71	5.35		_		3.14	9.14	12041	2079/10/84	>3966	> 2566
COMPLEX	PROTECTION CURRENT	576.55	112	1 10	MICA SULFIDE APPET	RECAY CIS MICHIE GRECKE (VER 2 NS PRINKWARE)	108	060 (MES 2.95)	Nes	19:78	5.38				3.55				W. Wales	1.550	0.555	2100002350	10500	0.857/
			_	-	MOSE NO. 600 - WRIGHT	RELAY CHEMISHT HELDAZ TA, LINVAL, AU	sceweruses	Dec and Creditaria	No			1071	6.16	-	-				-	-	-			
CHAV DURBON THE 4	2796V BAY CRECUE BUS COUPLER X AND Y	1980	30	100 A	CHROCARD CO., SCHOOL	REMOTE TERMINAL UNIT FORGOTO COO.	YORKID	CSD	Yes		-		- 6	301,07	9.49			-	X.34	9.14	> 2004	- 1000Ant-left	- 5-208A	1-300d
20508	PROTECTION CERCLE		Ш		MR05-016-594-309077 MR05-516-594-399077	RELAY COMMENT OF DISCOVER 2 33 PERMANEN	or sowerten	080 (NEW 2.100) SER-2022 (194) (44.8	Yes	12:17	549	10.97	549		_		-	-	1	l d				1
THEY INCOME THE B	PROVINCES CHIEF CHIEF CARGO	14948	77	100 C	# 100 - 100	PRIATE TRIBUNAL UNIT HOUSEPOOKS	POWERTER.	Chin	Tes:	1		111197	3,49	10.86	K 44		_	_	134	0.14	> 2066	369/6096	5-7944	+3566
DOMESTIC OF THE PARTY OF T	PROTECTION CONCUE	1000	12	1	WIND SEE NO. 47927	BRIAN CRIMERAL OF CHO CARL A ST HERWARDS	60	CRODARK S. BIE	Yes	12.40	3.40	200	200		200		-	_	7555	1.55	1000	more at	2000	1000
F3574			Ш.,		W006-503-606-199027	BELAY CERAGRATER SEC 1A, 125WE, 40	SCHWITTER	501-267 (3810418	166	1	1	1033	Set	1000					1					
Disconstant Talk I	275AV BAY CEP-CUE BUS COUPLIES AND Y	-GAR	36	KR 14	The state of the s	REMOTE TERMINAL UNIT FOXBORD USO	FORBORD	cie	764		1000		1000	11.18	5.50				343	3.43	1-20G	2039/20:34	> 1341	>100
00F1E	PROTECTION CURICLE		15		MINO 355-581-APROT	PERMY COMMUNITATION CONTINUES AND PREMIUMPES	65	080 (MTR 3.900)	Yes	11.00	1.00			1000						1650.0	600	0.1.27.15.15.75	20000	55500
					WINOS-003-547-HPROY	RELAY COMOMETER 383 TA, (25VB); 40	SCHWEITZEN	381-352 CM3 D418	No			11.11	5.59						1				1	1



	40 Subject to Powerlini's Still Safety Requir	nements, Cur	THAT IS	andered So	Authors and Implere entation blet	todologies. It may be more benefitial to algo with the recommo	-ded repleseres to the	frame of sessionary system	regularisent.												and company over	CREE REPLACEME	are the lander of	
totals:	(h) Recommended Timefrance is based on the	gority of Aqu	Ajmest	Neudb is	edices		STOREST PRODUCTS		17.0													IN ORTH REPLACEMENT TO ORTHO DISCLARIE I		
						each. A number of New Cabbu may be required if breather of us to the recommended timeframe. New Marshalling timets shoul																implementation		
678-7										10000	-000	1000	.0001	Two areas		ACVENU	E	(January)	· Cellusiana	TARD	CAP PARKED	Section	13355	TARD
141	CAP FAME.					SECONDARY SYSTEMS EQUIPMENT				348	108	11.6	AOF:	AUX	O96.	METERN	6	OPSWAR	CANLES EVE	MARSHALLING MODIC DIS	(Cherris)	Internet	CARLES	MARSHALL
			Т	\top			T							т			_		CBP Panels In				CSP Panels to	
													I				ш		HV field	Yes Meshaling		Section	Membelling	Yest
Farition	Fernil Description	Panel No.		e :n	Facethood to co.	Georgeton	Manufacturer	Multiporter	Chalesterie	17. Apr	н	177. April	- 10	IT Ass	**	17.744	н	07.440 IN	Marchalling	Koski (DI, Mr.,	CAP twods	Spaceer 8.	Hody ICE	Marshallo Knoto (Ch.)
1.675-0007	(METASANI)	202200	10	1	1000000000	111222220	1,1250,1330,00	14000041825-0	(Nex 2 Sect	12.50	1117	11.700			177	10000	7	100	CT, VT, AC, OX	C CONTACOS	Man Sand	Appliers Components	NEC, CT, VT.	CEVEAG
													I				ш		(DOUNE)	COOLWO		CHUMEN	ACDIC.	1000190
THE STAN - CENT	276/122/20 Style Theographotomick 276 to bear	4261	100	m 2.11	British as a Grand Service of T	REMOTE TERMINAL UNIT POSICIO CIO	roseno	CH	The .	-	-	-	\rightarrow	10.70	1.00	-	-	-	3.16	3.00	>2944	2029/30-84	> 2044	> 2000
a management recent	-ch-mockeds	-	1.0	-	H005 503 503 30907	RECENTIONS CACIND OF HE (2.00)	16	F16 (3.04)	Yes		5.41				-				1700	7375	2000	2000	2773	1000
					H965-553-543-30907	RELAT DITY 25-5059 (POLE AREYA MEAC)A	antiya.	MINCH	Ser	14,70										1			I	1
					9905-025-545-XFB07 94005-025-543-YFB07	RELAY TRANSFERRY OF THE BEY S (1A) (BU)	SCHWETZER	190 (3.46) 161-267 5 (34) (34)	Visi.	18,70	2.35			-	-	-			-	1			l	1
S THUR CITIES & COST	DATELLIS SIVA TRANSFORMER L'ANY SAF	+9413	- 20	09 8.30	HORE CIT PAY BYACOMI.	PRINCIP TRANSPORT DELIBER S (DA) (DA)	NOMERO.	1044	Yes			30.70		18.80	1.40		-		8.18	3.16	- 3.20M	2024/8181	> 3000	> 2046
	-co4-gze-cyrecus	1.00	1		HM5-053-545-XPEOT	RESAY TRANSF GALLAD OF FIRE CLIRIS	Of.	F20-(2,00)	Was	49.90	2.49						- 1							
					H905-525-548-XPROT	HELAN TRANSFERRY GETTIO (2.40)	GE.	190(0,46)	Yes .	22.51	1.40									1			l	1
					H365-011-645-39907	FELAY DEF 25-335V (POL) APEVA MEACLA	ANNA.	MFACM	No.	7.14	147			_					-	1				l.
GAP (2759V + C00)	275RV NAT +COR-CO II CARWOTOR SANK MOD	4710	100	OR 2.14	HIRE-SILESS-THROY HIRE-SILESSO-BAYCONT	PERFECTIONS OF SECUNDARY OF SEC	SCHMETORE FOXBORO	1045-3401-6-1140-[51.0	796	-	-	2041	0.40	10.00	4.70	-	-	_	3.14	2.14	-> 2011	2029/30 84	- 1044	> 2004
CAF (2758Y + C08)	E AND Y PROTECTION CHRISTS	1288	100	03 179	HARS SES SES - PUMAVE	CR SASS FORT ON MANY RELAY	ARE	CONTRACTOR (NO. 1/2)	Yes						10.00	-			214	3.14	>3944	Service Bri	13044	×2044
					HORE 505 585 19907	WHERE CAP PROTES AND SPRITS INC.	444	SPACING	No.	10.98	5.38			-	7.73					1			I	1
					H005-555-585-30907	RELATION ALSTON MINIST BANGE 25-315 VAL	ALSTON	MPACM	No	18:56	5.25						- 1		1	1			I	1
					PRES-000-060-XPROT	RELAT COMUNE OF CONTACT ASSISTMENANCE	Of	CB0 (VER 3.50)	The	32,60	3.30									1			I	1
					H905-035-683-VPROT	RELAY CAPPROTN ASS SPACKED.	ABE	UPA1900C	56		1000	3516	5.21	_						1			I	1
					HIRE GLARG WHOT	RELAY CRIMAN SEL CRUIT DAY	NAME OF TAXABLE PARTY.	984/360K	12		_	35.66	4,18	-	-	-			-	1			ı	
SVC 0059W +000	275kV BAY 007-Q10-0VC TREPOR X AND Y	12A3	100	00 3.6	1 14905-535-594-8AVCONT	REMOTE TERMINAL DIRECTORDORS COD	FOXBORO :	000-001-1 (04)	- Thi	_	-	3006	2.26	21.00	130	_	-	-	340	242	> 2040	2006/28 ks	> 2040	>200
and and and	PROTECTION CARCUS	- 140	1		H385-016-504-39907	PRIATICS MONEY OF CHOTHER 2 29 HISTORIAN (19)	GE .	GRIVELING.	Was	11.18	5.50			-	200		-		-			20000000		
	,				HR5-515-584-7FECT	PRIATION MONTHS SACIA, 125WE, AU	SCHWEIGER	THE PROGRAMME	100	-		31,10	4.11											43
DUBY FEEDER FEED	DANY FEEDER FLOO (DISK-003) - MURICARI	-0603	. 10	07 114		REMOTE TERMINAL LINET FORESCHO (50)	F0X8090	C56	Yes		1000			11.40	121				1.14	.0.14	>2944	2025/30-84	×3944	> 2044
-010	CUBICLE X & Y PROTECTION CUBICLE		11		HRES 255 7150 HPROT	HELAY DISTANCE MICCOM PHILE WITH INFORTE	ALIDVA	PHO WITHSPEED	764	28.67	5.25						-			10	5.43340	100.000		1 10000000
Say resten 147 (40 in	1500V PRESENTATIONS (ILD. TRAVEISTON	+187	-		H005-303, 7180-97807 H005-515-261-8470097	REAR DOTABLE SELECT CAS REMOTE TERMINAL UNIT FUNCTION CNO.	SCHWEITZER FORMIRE	patraget (rat	Vari		10000	3149	1.21	11.00		-	-	_	514	514	>386	2025/50.04	2000	+ 2044
YOU LEDNEY 141 141 IN	THE CHAMPS CUBICLE & BY PROTECTION	1180	100	50	PRE-035-747-8500	DEWAY OWITS HOUT BY ALL STREET	DEWAR	04/3000 M.	Yes		_			11.41	5.75				5.14	514	1.7.500	100,000,000	1 2004A	17,044
	COREST.				H005-005-747-7587	DEBAR DML00 PROT SQ VF 30-309V JUPPET	DEWAIL	DATEM N	Yes		-		- 1		6.71		-		-					
					HIRE GIA 243 3FR07	PRIAR DISTANCE MICCON PAGE (WITH RATIONS)	ARTHUR .	PAG (WESHINGTON)	Yes	18.61	4.44									1			I	1
					HIRE-SES-IND-YEROT	PESAT SICTARIO SESSILIC (IA):	SCHWITTER	20-H1036A	701			3546	5.01											
LUNY (1830) 740 (-010	Sides (IRDE) 748 (DIR-Q10-COOKS) TIE	-338	10	65 11		REMOTE TERMINAL DIRECTOR/GORG CIGO	F0X8030	CS0	. Yes .						1,27				3.16	3.14	>2046	2623/30-34	> 2046	> 2044
	DWMP4) CHRISE'S & FRICTECTION				HIRS SIX 749-PS26T	DEBANG CHALLOW FROM THE WEST SERVICE MATERIAL CHARLOW SAFELY	CHWAR	DMC100 W	The Tax				- 1		in.	-			-	1			I	1
					H965-515-746-97907	PELAY DETANCE MICCOM PAGE (ANTHIO PECATO	AND A	PAG (WITH IVECKT)	Yes	18.53	2.07			100	545.		- 1			1			l	1
				-	HIRES GAS THE YEROT	RELAY DISTANCE SEL DISSC (SA)	SOMETARY	20, 3111 (18)	Yes			12.69	634								1-10-110	100,000	1000	
AUNT PROPER THE HOSE	SUNV HEDER THE COLUMN C	1888	10	09 4.14		REMOTE TERMOSING UNIT HONOCHOICHO	9000E101	EMI .	Yes			-			5.31				E14	834	>3060	DOM:NO	>2000	> 2048
	CONTRACT A PROPERTY OF CONTRACT	2007-01	1	1	HM6-535-764-PSETTS	DEWAR DRIEDS PROT SIGNESSON SUPPLY	DPW45	DMC00 VF	Yes						5.75				7,500,00	5,7,35,54	20,000	2000	361.76	1.11-05-23
	Design and the second				1980-025-764-PSHTB 1980-025-764-3FB0T	WILLSTAD PROTISIC WIS TONE (FO 48-525) CORRECTIT HELAN MICCOMPRES + JAC POINT	WLEECTHOWG	1045 MF PS43 (v Jud Forti)	The	12.50	625			10.25	3.13					1			l	1
					HIRE GIS 264 WHILE	BULLY DETAILS AS WELL IN	NAME OF THE PARTY	SH STICITAL	Yes	12.40	6.75	36.61	4.00				-			1			I	1
DON'THEORY WE INDI	S SONO PREPER VIS COCO-GLO - HILLINARI	1343	10	09 3.34		PEWGTE TERMINAL UNIF FORGERO CSC	F049080	156	700		-			10.37	5.39		_		3.14	334	>2944	2025/30:01	1,3995	>2046
	CHEKLE'S & Y PROTECTION CHECLE				H005-525-765-PSD(TI)	DENIAR SANLOW PROT INC YE SO ADMINISTRAL	DEWAR	III WOLLOO VII	Yes.						121									
					HORSELL WILL PERFOR	HELD THE PROTESSION AND TONE OF THE PARTY.	RI RECTIONS	WOME UT	Yes					18.07	5.30		_			1			I	1
					HRB 505-765-30907	COMMINISTRACE (BIRT ALCOM PRIO	ALSTOM MICOM	PRO INVOC	TH	23,50				-	_				-	1			l	1
					H905-015-765-XFR07	CUM DITY NEAT MEDIAN PSAS + 2ND PORT RELAY DICTARIOS SEL SIZE (SA)	SCHWEITZER	PSG (+ 2nd Port) SD, at at the flux	Yes	10.56	5.28	40.07	2.00	-		-	-							
Their compact and law rate	Lifecy Header and Irida and Housewell	408W	10	09 8.34	PARES SEE RECT BAYCONT	REMOTE TERMINAL DINT FORBOTIO CHO	FOXED BO	CSS CSS	Yes	-	-	Bind!	5-47	10.86	5.60		-	_	818	834	>300	DOM:NO	> 2000	>2048
	CORECE VA Y PROTECTION CONCUR	5000	. 50	11	HOSE ASSESSED PRINTY	BELETING PROFESSIONS UP AS SINK	BELEGECTRONES	WINE DIGITAL	Yes					12.34	6.07		_		1000	673000	25,500	2000	257.00	Marie
					H005-515-807-P55TA	DEWAR DATEAU PROT NO DIG NO SELVENDERE	DEWAR	HMIDD DOME.	794						4.41					1			I	1
					PRO-001-R07-P0079-	NET 3140 SHOT IND DRIVING 49-112A	WLEECTYCHICS.	8548 DISITAL	Yes				-	12.36	6.07		-		-	1			l	1
					H965-035-607-99907	CUBICIST RELAY MEDION PS-44 + 2ND PORT RELAY DETARCE SPL-421 (S-4) (S-6)	MECOM SCHWITTER	PSet (+ 2nd Puril) DEL-ACLUAL DEC	791	11.00	6.48	95.86	2.00	-	-				-	1			l	1
MAN PROPERTY AND ADDRESS.	2764V FEIDER BLD (CED-CLD - PALAMACOCCE	-deu	100	02 . 1.10	HIRD-GID-GID-BAYCONT	REMOTE TERMINAL UNIT TORICHO CNO	FORMORD .	icse	Yes		_	31,46	240	11.76	130	-	-	_	3.16	3.14	>294	2029/30-84	> 2044	>2044
the first state of the same	CLIBELS & B.Y.PROTRETION CLIBELS	444	1		H905-GG-610-45RT	DENNA DALLOS PROT HIS DISLOS SERVISIPRIA	DEWAR	DWILLIO DIGITAL	Yes						4.00					234	2.000	2001/30:30	2 8000	
	posterii Sanonini etti etti				HIRS GO BOD POSTA	DENNE ONLINE PROTING DIG 90 JOAN SUPRY	DEWARI	SIMSJOO DIGITAL	Yes					11.10	4.00					1			I	1
					HIRE-SIGNAL PRINTS	BINL STAR PRIOT THE DISCUSS 48 1284	OF LESCHORICS	HOME DISTRIC	Yes		150			12:34	9.07					1			I	1
					HW5-015-610-XFE07.	RESET CURR DIFF DISTANCE MICCOM FSMI	ARDVA.	F546	Yes	10.76	5.30	177		-					-	1			I	1
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	SVC BUILDING +4 125V DC DISTRIBUTION		200		90		SVC BUILDING NA 1254 DC DISTRIBUTION BOARD								4						0		2028		



Planning Report		9/04/2020
Title	CP.02392 – H005 Woolooga Second Replacement 1	ondary Systems
Zone	Wide Bay	
Need Driver	Emerging compliance risks arising obsolescence of Woolooga's agei	
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/obsolescence 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	ecutive Summary	. 1
1.	Introduction	. 3
2.	Woolooga Demand Forecast	. 4
3.	Statement of Investment Need	. 6
4.	Network Risk	. 6
5.	Non Network Options	. 7
6.	Network Options	. 7
6.	1 Proposed Option to address the identified need	. 7
6.	2 Option Considered but Not Proposed	. 8
6.	2.1 Do Nothing	. 8
7.	Recommendations	. 8
8	References	8

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.

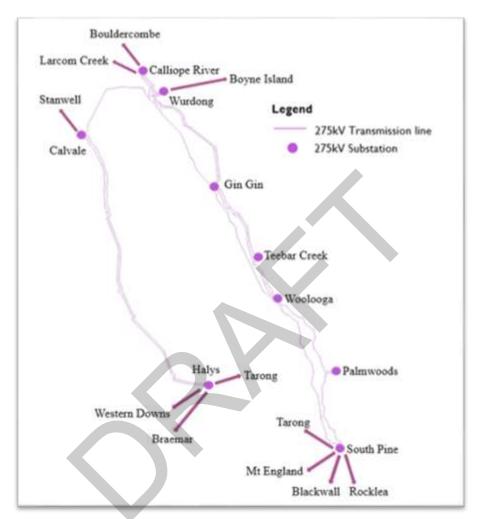


Figure 1: Woolooga locates on the CQSQ transmission corridor

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 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;

- 1. The 275kV switchyard, which has feeders connecting to Gin Gin, South Pine, Palmwoods and Teebar Creek, and
- 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.

Figure 2 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.

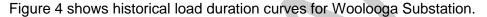


Figure 2 – 275/132kV Woolooga Substation and SVC Electrical Single Line Diagram

Figure 3 shows that the Woolooga Substation supplies the loads at Kilkivan, Mungar, Gympie, Cooran, Noosaville, Sunrise Hill and QR Traveston.



Figure 3 - Woolooga supply area



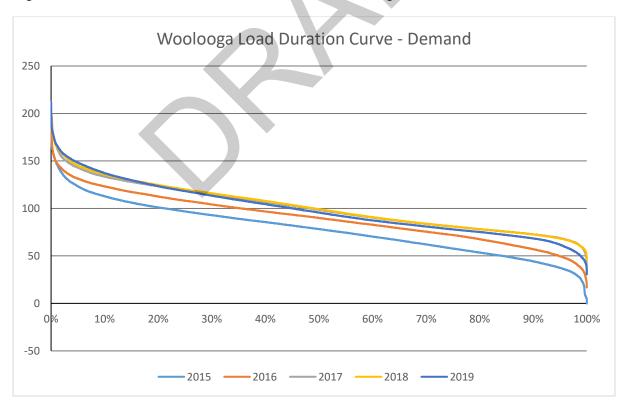


Figure 4 - Load Curve for Woolooga 132kV

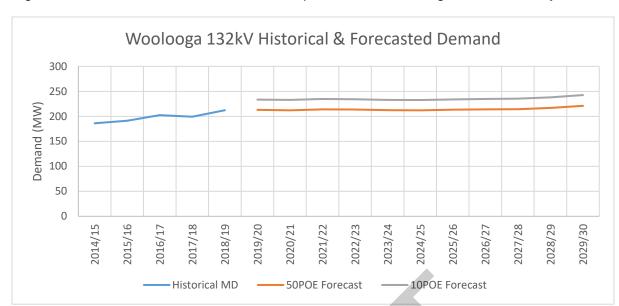


Figure 5 shows the historical and forecast of peak load at Woolooga in the next 10 years.

Figure 5 - Woolooga 132kV Maximum Demand

Figure 5 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

The table below presents the load at risk, as well as the energy at risk, at Woolooga 132kV.

Table 1 Load at Risk

Load At Risk	Contingency Event	Quantity	2020	2030
	W 1 7 1	Max (MW)	240	250
Woolooga Total Secondary Systems Outage Kilkivan Load Feeders 764 and 765 Mungar Load Feeder 7190 Gympie, Traveston, Cooran, posaville and Sunrise Hill Load	Average (MW)	116	117	
Woolooga TCP Load	Woolooga Total Secondary Systems Outage Kilkivan Load Feeders 764 and 765 Mungar Load Feeder 7190 Propie, Traveston, Cooran, aville and Sunrise Hill Load	24h Energy Unserved Max (MWh)	3750	3804
		24h Energy Unserved Average (MWh)	2789	2819
	oad Feeders 764 and 765	Max (MW)	20	21
Woolooga Total Secondary Systems Outage Kilkivan Load Feeders 764 and 765 Mungar Load Feeder 7190 Symple, Traveston, Cooran, osaville and Sunrise Hill Load	Average (MW)	9	9	
Kilkivan Load	Woolooga Total Secondary Systems Outage Feeders 764 and 765 Feeder 7190 Feeders 747 and 748	24h Energy Unserved Max (MWh)	332	339
		24h Energy Unserved Average (MWh)	207	208
Woolooga Total Secondary Systems Outage Kilkivan Load Feeders 764 and 765 Mungar Load Feeder 7190 Gympie, Traveston, Cooran, oosaville and Sunrise Hill Load	Max (MW)	9	9	
	Average (MW)	3	3	
	24h Energy Unserved Max (MWh)	115	120	
	Woolooga Total Secondary Systems Outage 24 Feeders 764 and 765 Feeders 7190 Feeders 747 and 748 MARCH AND	24h Energy Unserved Average (MWh)	64	67
		Max (MW)	214	224
Mungar Load Feeders 764 and 765 Mungar Load Feeder 7190 Symple, Traveston, Cooran, Feeders 747 and 748	Average (MW)	105	106	
Noosaville and Sunrise Hill Load	Feeders 764 and 765 2 Reeder 7190 A A A Feeders 747 and 748 A A	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.

Potential non-network solutions may provide supply to individual 132kV Woolooga loads (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.

1.1.1 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 System Standards of the National Electricity 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
- Transmission Annual Planning Report 2019
- 3. Asset Planning Criteria Framework

Base Case Risk and Maintenance Costs Summary Report for Reset

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 service 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;
 and
- 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.

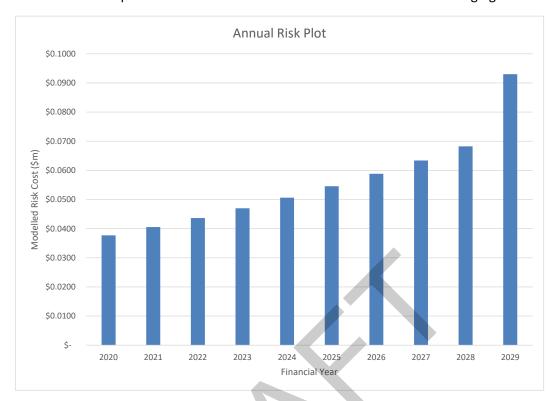


Figure 1 – Woolooga secondary systems total risk cost

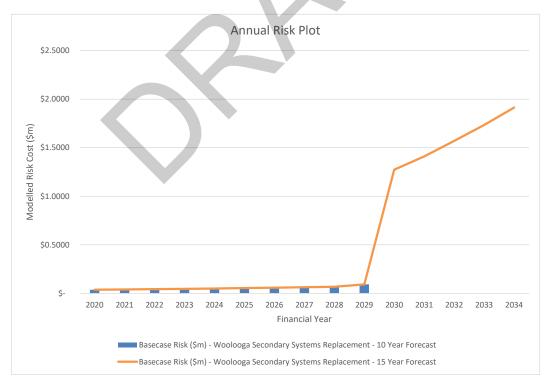


Figure 2 – Woolooga secondary systems risk cost (10 and 15 years)²

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).

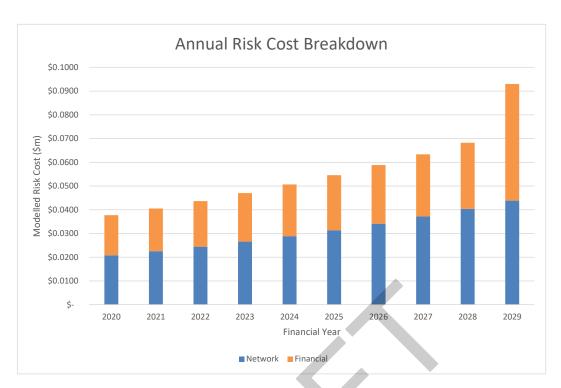


Figure 3 – Woolooga secondary systems risk cost by category

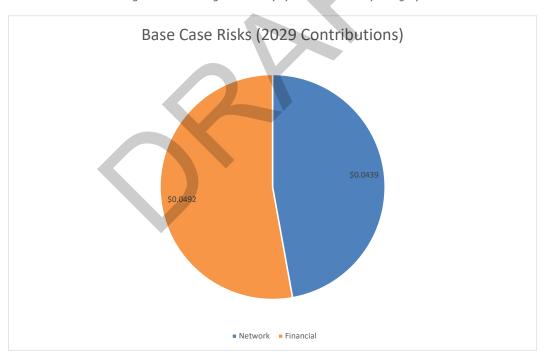


Figure 4 – Woolooga 2029 risk cost by category

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.

Version 1.0 Page 4 of 6

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	7	Days
Financial	Emergency replacement cost with spares	0.01	\$million
rillalicial	Emergency replacement cost with no spares	0.1	\$million

Table 1: Input values, secondary systems model

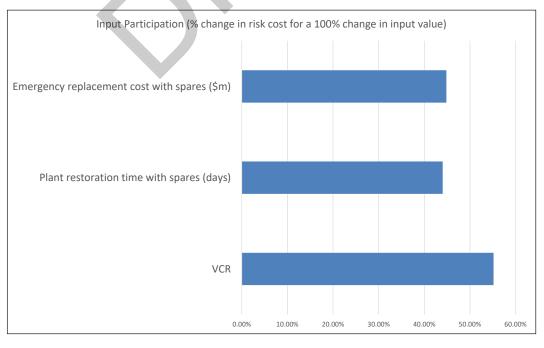


Figure 5 - Participation factors, secondary systems model – pre secondary systems obsolescence

Version 1.0 Page 5 of 6

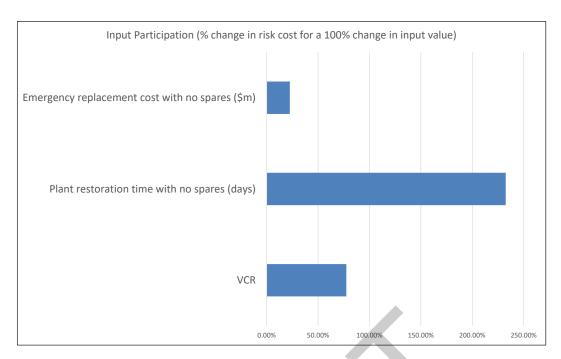


Figure 6 - Participation factors, secondary systems model – post secondary systems obsolescence



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
20/04/20		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		Ext.
Connection & Development Manager	<name></name>	Ext.
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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 1 – 132kV/275kV Woolooga Substation and SVC Aerial View

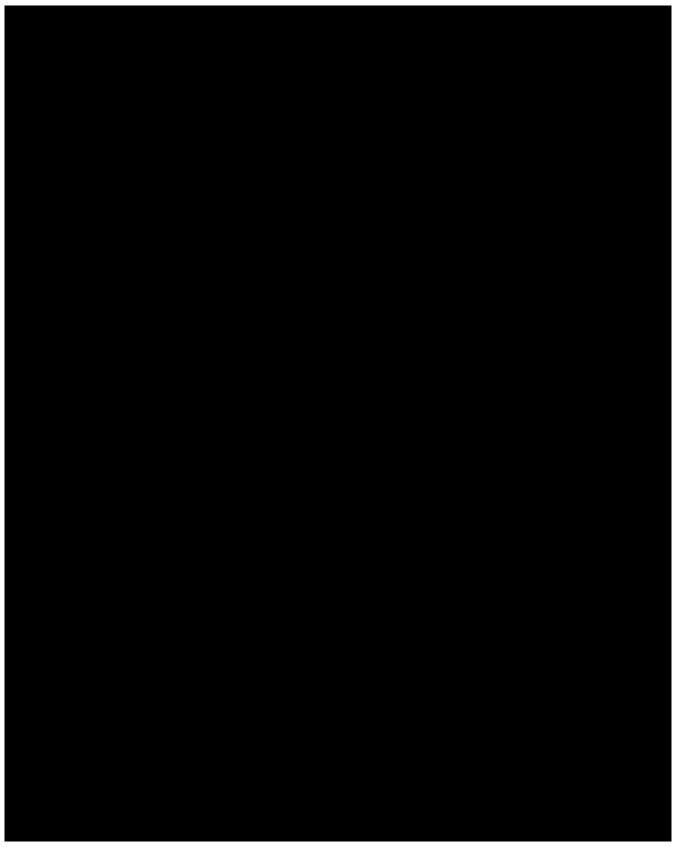


Figure 2 – 132kV/275kV Woolooga Substation and SVC Electrical Single Line Diagram

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;
 - o 275kV Bus Zone 2;
 - o C01 275kV Bus Coupler 1;
 - o C01 275kV Feeder 813/815 Calliope River Tee Gin Gin;
 - C02 275kV Bus Coupler 2;
 - o C02 275kV Feeder 807 South Pine;
 - o C02 275kV Feeder 814 Calliope River Tee Gin Gin;
 - o C03 275kV Bus Coupler 3;
 - o C03 275kV Feeder 810 Palmwoods;
 - o C03 275kV Feeder 8850 Teebar Creek;
 - o C04 275kV Bus Coupler 4;
 - C04 Transformer T5 (275kV);
 - o C05 275kV Bus Coupler 5;
 - o C06 275kV Capacitor Bank 3;
 - o C07 275kV Bus Coupler 7;
 - o C07 Transformer T3 (275kV):
 - C07 275kV Static Var Compensator 4;
- Replacement of 125V DC X & Y DB, Batteries, Battery Charger and Cubicle;
 and
- 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):
 - o 132kV Bus Zone 1;
 - o 132kV Bus Zone 2:
 - o D02 132kV Feeder 764 Kilkivan
 - o D03 132kV Feeder 765 Kilkivan;
 - D04 Transformer T5 (132kV);
 - o D05 132kV Bus Coupler;
 - o D11 132kV Capacitor Bank 2;
 - o D12 132kV Capacitor Bank 1;
 - o D14 132kV Feeder 7190 Mungar;
 - D17 Transformer T3 (132kV);
 - o D18 132kV Feeder 748 Cooroy Tee Gympie;
 - 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 Relat	ed Projects		
CP.02810	Woolooga SVC Secondary System Replacement	31 Oct 2029	



Version: 1.0

Replacement

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



Version: 1.0

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

Table of Contents

1.	Exe	cutiv	ive Summary	3
	1.1	Proj	eject Estimate	3
	1.2	Proj	oject Financial Year Cash Flows	4
2.	Pro	ject	and Site Specific Information	4
	2.1	Proj	ject Dependencies & Interactions	4
	2.2	Site	e Specific Issues	4
3.	132	/275	5kV Secondary Systems Replacement	4
	3.1	Defi	finition	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	oject 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	oject Estimate	12
	3.4	Proj	oject Financial Year Cash Flows	12
	3.5	Proj	oject Asset Classification	12
4.	Ref	eren	nces	13

Current Version. 1 1/00/2020	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland
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 - Reset 2023-27 Project		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		
To June 2026		
To June 2027		
To June 2028		
To June 2029		
To June 2030		
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.

Current version: 14/09/2020	HARDCORV IS LINCONTROLLED	Page 4 of 13
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Current Version. 1 1/00/2020	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland
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
- WHS requirements

Design, procure, construct and commission the following items:

From Building +2:

- Replacement of all 275kV secondary systems in the following panels:
 - o Bus Zone 1 & 2:
 - Bus Couplers
 - o 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);
 - 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;
 - o Capacitor Bank 1 & 2;
 - Feeder 7190 Mungar;

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



ASM-FRM-A3372053

Version: 1.0

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

- Transformer T3 (132kV);
- Feeder 748 Cooroy Tee Gympie;
- 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;
- cutover bays to new control system;
 - o 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.



132kV/275kV Woolooga Substation control room arrangement

Current version: 14/09/2020		Page 7 of 13
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Version: 1.0



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.

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Current version: 14/09/2020		Page 8 of 13



ASM-FRM-A3372053

Version: 1.0

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

- 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.

Secondary St	ystem Replacement	Construction/C	Commissioning	Stanes
Secondary S	vateiii Nepiaceiileiii	. 6011311 4611011/6	,011111115510111111Q	Stayes

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.

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Current version: 14/09/2020		Page 11 of 13



Version: 1.0

3.3 Project Estimate

Estimate Components - Reset 2023-27	7 Project	Base \$	Escalated \$
Estimate Class	3		
Estimate Accuracy	+ 30% / - 20%		
Base Estimate		26,799,956	37,516,088
Mitigated Risk			
Contingency Allowance			
TOTAL			

3.4 Project Financial Year Cash Flows

Cash Flow Table	June 2020 Base Date	Completion
To June 2025		
To June 2026		
To June 2027		
To June 2028		
To June 2029		
To June 2030		
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	HARDCORVIC HACOATROLLED	Page 12 of 13
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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



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