2023-27 POWERLINK QUEENSLAND REVENUE PROPOSAL

Project Pack – PUBLIC

CP.xxxxx Greenbank Secondary Systems Replacement

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CP.xxxxx – Greenbank Secondary Systems Replacement

Project Status: Not Approved

1. Network Requirement

The 275kV Greenbank Substation, approx. 42km south-east of Brisbane, was established in 2006 and is a major switching substation for south-east Queensland and connects major 275kV transmission lines from the south-west. The substation includes an adjacent Static VAR Compensator (SVC) yard, commissioned in 2008 to provide reactive power support, voltage control and critical power system damping in the area. An outage of this asset would put up to 360MW of power and up to 7,500MWh of energy per day at risk².

A Condition Assessment (CA) carried out in February 2020 identified that most secondary system assets at Greenbank Substation will reach the end of their technical service lives between 2026 and 2028¹. 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 5.1.9(c) of the National Electricity Rules (NER) and Australian Energy Market Operator's (AEMO's) Power System Security Guidelines (V95, 2019).

Energy Queensland forecasts confirm there is an enduring need to maintain electricity supply to the Moreton South area. The removal or reconfiguration of the Greenbank Substation due to secondary system failure or obsolescence would violate Powerlink's Transmission Authority reliability obligations (N-1-50MW / maximum 600MWh unserved energy). It would also significantly impact the power transfer capability between south-west and south-east Queensland and would impact the reliability of supply to the Moreton South and Gold Coast areas. 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 secondary systems at Greenbank 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 this stage no viable non-network options have been identified.

Figure 2-1 shows the current recommended option reduces the forecast risk monetisation profile of the Greenbank Substation secondary systems to \$10k 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 \$20k per annum in 2026 to an estimated \$400k per annum in 2029 and continues to rise each year thereafter. The significant increase in risk cost in 2027 coincides with the depletion of available spares, which results 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

2023-27 Revenue Proposal



Figure 2-1 Annual Risk Monetisation Profile (Nominal)

3. Cost and Timing

The estimated cost to replace the 275kV secondary systems at Greenbank Substation is 29.6m (2023/24)⁵.

Target Commissioning Date: December 2029

4. Documents in CP.xxxxx Project Pack

Public Documents

- 1. Secondary System Condition Assessment Report S003 Greenbank 275kV SVC, 275kV Substation
- CP.0xxxx S003 Greenbank 275kV SVC and Secondary Systems Replacement Planning Statement
- 3. Base Case Risk and Maintenance Costs Summary Report Greenbank Secondary Systems Replacement
- 4. Project Scope Report CP.0xxxx Greenbank Secondary Systems Replacement
- 5. Concept Estimate for CP.0xxxx Greenbank Secondary Systems Replacement

Supporting Documents

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





S003 Greenbank 275kV SVC 275kV Substation

Secondary Systems Condition Assessment Report

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1.0



S003 GREENBANK 275KV SUBSTATION AND SVC

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1. Introduction

S003 275kV Greenbank Substation and Greenbank SVC is a major switching substation in South East Queensland. It was established in 2006 to accommodate network augmentation / expansion at the time. This substation is an integral part of the Queensland transmission backbone. Greenbank substation is located approximately 42 km South West of Brisbane CBD. The 275kV SVC, is adjacent to the substation, was commissioned in 2008 to provide fast reactive power support in the area.

The focus of the report is to assess the conditions of secondary systems assets and to recommend the reinvestment timing for these assets. 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.

Greenbank Substation and SVC primary equipment bays include:

Та	ble 1 – Gr	eenbank S	ubstation Netw	ork Elements	
L	ocal Subst	tation (S00	3 Greenbank)		Remote
					Substation
	Voltage	Quantity	Bay	Operational	
	(kV)		Designation	Element	
Feeders	275	13	=C04-Q10	8813	Loganlea
			=C04-Q20	8824	Molendinar
			=C05-Q10	8822	Belmont
			=C05-Q20	8825	Molendinar
			=C06-Q10	805	Swanbank E
			=C06-Q20	835	Mudgeeraba
			=C010-Q10	597 (Spare)	
			=C010-Q20	836	Mudgeeraba
			=C011-Q10	8888	Blackstone
			=C012-Q10	8887	Blackstone
			=C013-Q10	8848	Middle
					Ridge
			=C014-Q10	8849	Middle
					Ridge
			=C014-Q20	5811 (SVC)	
Capacitor	275	5	=C08-Q10	Cap 3	
Banks			=C08-Q20	Cap 4	
			=C15-Q10	Cap 5	
			=C15-Q20	Cap 6	
			=C16-Q20	Cap 8	
Reactors		0			
Transformers		1	=C14-Q20, -	SVC M11	
			Q30		
Busbars	275	2	=KC1	1 Bus	

Substation:

Objective ID:



		5		=KC2	2 Bus	
- 5	8	3 8	3 A	2	200 C	

SVC:

	Table 2 -	Greenban	k SVC Network	Elements											
Loc	al Substat	ion <mark>(</mark> \$003 (Greenbank SV	C)	Remote Substation										
	Voltage (kV) Quantity Bay Designation Operationa Element sformer 17.2 / 275 kV 1 =C014-Q20 and -Q30 11 SVC														
Transformer	(kV) Designation Element nsformer 17.2 / 1 =C014-Q20 11 SVC 275 kV and -Q30 11 SVC actors 17.2 1 TCR1														
Reactors	275 kV and –Q30 eactors 17.2 1 TCR1 TCR 1														
Capacitor		5	TSC1	TSC 1											
Banks			TSC2	TSC 2											
			HF5	5 th Filter											
			HF7	7 th Filter											
			HF11	11 th Filter											
Busbars		1		SVC LV Bus											



Figure 1 – 275kV Greenbank Substation and SVC and 275kV Substation Aerial View





Figure 2 – 275kV Greenbank 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,
 - 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.

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 latter is considered more subjective than the former.

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 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 equipment health indices based on the optimisation of risk, cost and performance of Powerlink's secondary assets since 1999. Equipment 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. Generally, equipment with condition scores close to ten represent moderate increase of functional failures, but longer outage duration and significantly higher risk of impacting system's availability and reliability due to the obsolescence of the equipment.

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 three (3) demountable control buildings, except that some small quantity of OpsWAN equipment are installed in the Amenities building (+1) and telecommunication building (+2). The buildings +1 to +6 are located within the substation perimeter fence.

4.2 SVC Control Building

The SVC building (+7) is located within the SVC perimeter fence, which is 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 no spare capacity to accommodate additional secondary system panels if required.



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

Table 3 – Gr	eenbank Subs	station and SVC Buildin	igs
Building Description	Designation	Functional Use	Spare Sec Sys Panel
			Spaces
Amenities Building	+1	Amenities	N/A
Communications	+2	Comms equipment	N/A
Work shed	+3	Maintenance	N/A
	Workshop		
Substation Secondary System	+4	Sec Sys Bays = C04,	12
Building +4	=C05, =C06		
Substation Secondary System	+5	Sec Sys Bays = C08,	9
Building +5		=C09, =C10, =C11,	
		=C12	
Substation Secondary System	+6	Sec Sys Bays = C13,	13
Building +6		=C14, =C15, =C16	
=M11 SVC Building +7	+7	SVC Sec Sys,	N/A
		Thyristor Valves and	
		Valve Cooling	



(a) Building +4





(b) Building +5

1.0





(c) Building +6

Figure 3 - S003 275kV Greenbank Substation secondary systems and SVC Buildings

5. Condition Assessment

5.1 Secondary System Outdoor Marshalling Kiosks

Greenbank substation and SVC marshalling kiosks were installed between 2006 and 2008. The kiosks are still in serviceable condition and should last another 20 – 25 years. 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. Otherwise, any degraded links and terminals should be replaced as part of secondary system replacement project in 2027 / 28.

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 are illustrated in Figure 4 below.





(a) =C04-A10 Bay Marshalling Kiosk



(b) =C04-A20 Bay Marshalling Kiosk





(c) =C05-A30 Bay Marshalling Kiosk



(d) =C05-A20 Bay Marshalling Kiosk



(e) =C08-A2 – 2 Bus CT Marshalling Kiosk

1.0





(f) =C08-A50 - 1 Bus VT Marshalling Kiosk



(g) =C08-A60 - 2 Bus VT Marshalling Kiosk



(h) =C06-A91 Diameter =C06 AC Marshalling Kiosk

1.0





(i) =C06-A92 Diameter =C06 DC Marshalling Kiosk

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

5.2 Outdoor Secondary System Cables

Outdoor secondary system cables are still in good condition as shown in Figure 5. Visual inspection of these cables indicated that they can be kept in service until at least 2043.



Figure 5 – Physical appearance of typical outdoor secondary system cables



5.3 Indoor Termination Racks / Yard Interface Cubicle

There is no building termination racks at Greenbank 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 ease labour efforts required for the secondary system replacement projects.

5.4 Indoor Secondary System Cables

All cables inside the control buildings are considered to be in good condition as they have been in clean and air-conditioned environment since installed round 2006 / 2007. The replacement of indoor cables is deemed unnecessary until at least 2043.

5.5 Control and Protection Systems

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

5.5.1 Secondary Systems Panels

All secondary systems panels, including auxiliary parts e.g. links, terminals and internal wiring were installed between 2006 - 2008 and currently still in good condition. They are suitable for service until 2027/28.



=C04-Q20

=C04-Q30

Version No:

=C04-Q20

1.0





=C10-Q10

=C10-Q30

=C10-Q10







- (a) SVC Control and Protection Panels
- (b) SVC AC Protection Panels





(g) Yard Interface panel

Version No:

(h) AC Changeover and Battery Charger

Figure 7 – Typical SVC Indoor Control and Protection Panels at Greenbank SVC





Figure 8 – SVC Cooling Control System Panel

5.5.2 Revenue Metering Panels

Greenbank Substation and SVC secondary system do not have revenue-metering panels.

5.5.3 OpsWAN System Panels

OpsWAN systems and equipment at this site were installed around the same time as the secondary systems, i.e. between 2006 and 2008. 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 only be replaced opportunistically 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 refurbishment projects.





+4 OpsWAN Panel

+5 OpsWAN, LCF and NSCs +

+6 OpsWAN Panel

Figure 9 – Greenbank Substation and SVC OpsWAN Panel

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

5.5.4.1. Control, Protection, Auxiliary, Ancillary Equipment

Greenbank Substation and SVC secondary system comprises mostly microprocessor based control and protection equipment. There is a small number of solid state and modern electromechanical 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 10 – Greenbank Substation Typical Indoor Secondary System Equipment (2006 - 2008)



Figure 11 – Greenbank SVC Typical SVC Indoor Secondary System Equipment (2008)

5.5.4.2. Revenue Metering Equipment

Greenbank Substation and SVC system does not have revenue meters.



5.5.4.3. OpsWAN Equipment

Greenbank Substation and SVC's OpsWAN equipment were installed between 2006 and 2008. They should only be replaced as part of the SVC secondary system replacement project, anticipated in 2027/28.



Figure 12 – Greenbank Substation and SVC OpsWAN Equipment

5.5.5 Auxiliary Supply

5.5.5.1. 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 2027/28.

5.5.5.2. DC Batteries and Chargers

Greenbank Substation and SVC have four (4) sets of 125VDC X and Y batteries and associated chargers installed between 2006 and 2008 as detailed in the Appendix A. Generally, there is one set of duplicated batteries and chargers per secondary system building. Based on experience of battery and charger reliability, substation DC batteries' expected lifespan is 12 years while chargers' expected lifespan is 20 years. Therefore, all batteries at Greenbank substation and SVC should be replaced as soon as possible. Battery monitors and chargers should be replaced around the 20 year cycle.



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(Buildings +6 Chargers - 2007)



(Buildings +7 - SVC 125V X and Y DC Batteries and Chargers - 2008)

Figure 13 – Greenbank Substation and SVC 125VDC Batteries and Chargers

6. Conclusion

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



Please refer to the last four (4) columns in the 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> – S003 275kV Greenbank Substation and SVC Secondary Systems Equipment Health Indices and Recommended Asset Placement Replacement Timeframe.

8. References

- "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.
- [3] Powerlink Asset Risk Management Framework, ASM-I&P-FRA-A2417558, Powerlink Queensland, 2019.



9. Appendix A

	APF	PENDI)	(A ·	SO	03 GREENBANK	275KV SUBSTATION AND SVO	SECONDA	RY SYSTEMS	- EQUIP	MEN	T HI	EAL	TH IN	IDIC	ES A	ND	RECOM	MEND	ED I	REPLACE	MENT TIN	EFRAN	1E		
Notes:	 (a): Subject to Powerlink's OBA (b): Recommended Timeframe (c): Based on Visual Inspection (d): As a minimum requirement 	1 Safety Req is based on r and Subject Rubber Sea	uiremen majority to the d sis, Air f	nts, Cur y of Equ lecision filter an	rrent Standard Solutions and Impl upment Health Indices n of the Control Building and Seco Id Terminals and Links are require	ementation Methodologies, it may be more beneficial to a ndary Systems Panels. A number of New Cables may be re d to be repaiced by the recommended timeframe. New N	lign with the recomm quried if location of c larshalling Kiosks sho	ended replacement timefr ontrol building or seconda uld be considered if Exsitir	rame of sedonder ry systems panel ng Cables are to b	y system i is chang e reaplai	s equipri jed. jed.	nent										RECOMM Trigger C Solu	ENDED REPLAC Conditions only, tions, impleme	EMENT TIMMII Exclude consid	NG (Based on lerations for lologies)
BAY	C&P PAJ	NEL				SECONDARY SYSTEMS EQUIPMENT					Х-Р	ROT	Y-PR	ют	AUX 8	CTRL	REVENUE	OPS	NAN	CABLES (HI)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chassis)	Sec Sys Eqiupment	CABLES	YARD MARSHALLIN G KIOSKS
Function	Panel Descripion	Panei No	Year	н	Functional Loc.	Description	Menufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	err. Age	н	Eff. Age	н	Eff. Age	H	Eff. Age H	Eff. Age	н	C&P Panels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, CDOUING)	Yard Marshailing Klosks (CB, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshaling Kiosks (CB, MK, CT, VT, AC, DC, CODUING)	Yard Marshalling Kiesks (CB, MK, CT, VT, AC, DC, COOLING)
SVC CONTROLLER	SVC CONTROLLER	U1+5J1	2008	3.43	5003-555-115C-CONTSYS	SVC CONTROLLER	SIEMENS	SIMATIC TDC UR5213	No	1	8 8				16.67	8.33	8 8	3 7		3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
		026625	- 22	10.000	5003-555-11SC-INDMET	CURRENT ADAPTOR (=U1+SJ1-T15)	SIEMENS	0-1A-5A / 0-3.5V	No	8	5				11.08	5.54	8 B	1 3		S 2783		020333		1213-121	1000000
					S003-SSS-11SC-INDIMET	CURRENT ADAPTOR (=U1+S/1-T16)	SIEMENS	0-1A-3A / 0-3.3V	No	8					11.08	5.54				1					
					S003-SSS-11SC-INDMET	CURRENT ADAPTOR (=U1+SI1-T13)	SIEMENS	0-1A-5A / 0-3.5V	No	8	2 3			1 1	11.08	5.54	£ 15			lê di					
					5003-555-115C-IND/MET	CURRENT ADAPTOR (=U1+SI1-T14)	SIEMENS	0-1A-5A / 0-3.5V	No	8	<u>18 - 1</u>		8 - 8	1 1	11.08	5.54	8 - 6	8 3	-	S					
					5003-555-115C-INDMET	VOLT ADAPTOR (=U1+SJ1-112)	CIEMENS	8	NO	5	8 6		i (1 1	11.08	3.34	8 8		-	e					
SVC VBE	TCR, TSC1 TSC2 VBE	U2+5J2	2008	3.43	S003-SSS-11SC-TCR1VBE	VALVE CONTROL UNIT (VBE)	SIEMENS	N-T722 3125-00003	N/A	N/A	-	1	<u> </u>		11.24	5.62		1	-	3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
					\$003-555-115C-TSC1VBE	VALVE CONTROL UNIT (VBE)	SIEMENS	N-T722 3125-00003	N/A	N/A		-	:	-	11.24	5.62	2 10		-	2	-				
					5003-555-115C-TSC2VBE	VALVE CONTROL UNIT (VBE)	SIEMENS	N-T722 3125-00003	N/A	N/A	5 3		. s		11.24	5.62	a 8	. .	-						
SUC DOCT	DC-CT ELECTRONIC	1124512	2005	2 2 42	CODD.CCC.() CC. DIAW	ELECTRONIC CHERENT TRANSPORTER RECEIVER	0(77	EM0/20142	No		-	-	-	-	*1.02	3.34	15 IV	-	-	2.42	2.42	> 2042	1028/28/5	> 20/2	> 20/2
SVC DCCT	oc-cresserionic	037233	2000	3.43	5003-555-115C-EMVI	ELECTRONIC CURRENT TRANSDUCER RECEIVER	RITZ	EMVI 701HZ	No	2	8 1		1 2	1	11.08	3.34	<u>i (</u>	1 3	1		3.45	2045	10101119 [0]	12045	
					5003-555-115C-EMVI	ELECTRONIC CURRENT TRANSDUCER RECEIVER	RITZ	EMVI 701HZ	No	2					11.08	5.54			1						
SVC LAN / HMI	LAN / HMI / SERVICE	X1+5B1	2008	3.43	5003-555-115C-HMI	MONITOR	FUJITSU SIEMENS	SCEENICVIEW P17-2	Yes	1	2 - 2 2 - 3				11.08	9.23				3,43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
					S003-SSS-11SC-TIMING	GPS CLOCK	SIEMENS	SICLOCK TS	No	3	÷ ,	-		-	11.08	5.54	0 0	-	-						
					5003-555-115C-OWNTWK	SWITCH (=X1+SB1-A10)	RUGGEDCOM	RSBOOT	NO	1			-		11.08	9.23	8 0		_						
						54000(-20000 200)											~ ~ ~								
					5003-555-115C-RTU	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	4	8 3	3			11.08	5.54	S - S	94 - S							
					S003-SSS-11SC-SVCNTWK	SWITCH (=X1+581-A3)	RUGGEDCOM	RSSOODT	No	1					11.08	9.23									
	8				5003-555-11SC-DATCONV	DATA CONVERTER COMPUTER	PCOMM	IPC 191 A	Yes	0	<u>i</u> 1				12.06	6.03	2 8	<u> </u>	1				-		
SVC PROTECTION	PROTECTION INTERFACE / DFR	X2+582	2008	3.43	SOO3-SSS-11SC-B/PROT	BINARY INTERFACE MODULE (=X2+SB2-A1)	SIEMENS	SU200	Yes	1					12.10	6.05				3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
					S003-SSS-11SC-DISTREC	TRANSIENT FAULT RECORDER (=X2+SB2-A4)	IBA	PADU	Yes	0					11.62	5.81	<u> </u>			1					
					S003-SSS-11SC-DISTREC	TRANSIENT FAULT RECORDER (=X2+582-A3)	IBA	PADU	Yes	0	Q 3				11.08	5.54	8 8		1						
					S003-SSS-11SC-DISTREC	TRANSIENT FAULT RECORDER (=X2+SB2-A6)	IBA	PADU	Yes	0	8 3	34 - 3	3	1 3	11.08	5.54	3 6		-	- E					
					5003-555-115C-DISTREC	TRANSIENT FAULT RECORDER COMPOTER	IBA .	IBA RACK PC	res	0					16.74	8.5/									
SVC	PROTECTION HV/LV/TEMR	R1+5R1	2008	3.43	5003-555-11SC-BUSXPROT	RELAY MULTIFUNCTION DIFF SIEMENS 75362	SIEMENS	75/62	No	3	11.08	3.54	1 8			1 8	8 8	8 8		3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
TRANSFORMER					S003-SSS-11SC-BUSYPROT	RELAY MULTIFUNCTION DIFF SIEMENS 75J62	SIEMENS	75362	No	3			11.08	5.54						1					
PROTECTION					S003-SSS-11SC-TRFXPROT	RELAY MULTIFUNCTION DIFF SIEMENS 7UT635	SIEMENS	707635	No	2	11.08	3.54	11111												
			_		S003-SSS-11SC-TRFYPROT	RELAY MULTIFUNCTION DIFF SIEMENS 70T635	SIEMENS	707635	No	2			11.08	5.54											
PROTECTION	ISC ICK PROTECTION	R2+SR2	2008	5.43	5009'535'115C-TCR1XPRO	NEEKT WOLFPONCTION DIFF SIEMENS 707612	SIEMIENS	701612	NO		11.08	5.54								5.45	3.43	> 2043	2028/29 (b)	> 2043	> 2043
					S003-SSS-11SC-TCR1YPRO S003-SSS-11SC-TSC1XPRO	RELAY MULTIFUNCTION DIFF SIEMENS 75/61 RELAY MULTIFUNCTION DIFF SIEMENS 7UT612	SIEMENS	75J61 7UT612	No	2	11.08	3.54	11.08	5.54	1		8	8 8	-	8					
								0																	
					S003-SSS-11SC-TSC1XPRO	RELAY CAPACITOR/FILTER TRENCH CPR04	TRENCH	CPR04	No	3	11.08	3.54	3	1		1 - 8	8 8	8. 8							
					S003-SSS-11SC-TSC1YPRO	RELAY MULTIFUNCTION DIFF SIEMENS 75361	SIEMENS	75J61	No	2			11.08	5.54		-	× 10		-	0					
					5003-555-115C-T5C2XPRO	RELAY MULTIFUNCTION DIFF SIEMENS 707622	SIEMENS	701612	NO	2	11.08	3.34													
					S003-SSS-11SC-TSC2XPRO	RELAY CAPACITOR/FILTER TRENCH CPR04	TRENCH	CPR04	No	5	11.08	3.54	8		1	8	8 8	98 - 5							
1		53			S003-SSS-11SC-TSC2YPRO	RELAY MULTIFUNCTION DIFF SIEMENS 75J61	SIEMENS	75/61	No	2	C.C.C.S	110000	11.08	5.54	1	1 - 8	8 - 12	3 S			14				
HARMONIC	HARMONIC FILTER PROTECTION	R3+5R3	2008	3.43	S003-SSS-11SC-11HFXPRO	RELAY CAPACITOR/FILTER TRENCH CPR04	TRENCH	CPR04	No	5	11.08	5.54								3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
FILTER					5003-555-115C-11HFYPRO	RELAY MULTIFUNCTION DIFF SIEMENS 75361	SIEMENS	75/61	No	2			11.08	3.34		1			-	-			N.275		1
NOTECTION					S003-SSS-11SC-SHFXPROT	RELAY CAPACITOR/FILTER TRENCH CPRO4	TRENCH	CPR04	NO	3	11.08	3.54	1	1		1		1	1	1		1	1	1	1
					S003-SSS-11SC-SHFYPROT	RELAY MULTIFUNCTION DIFF SIEMENS 75J61	SIEMENS	75/61	No	2	1		11.08	5.54	1			1		1					1
1					S003-SSS-11SC-7HFXPROT	RELAY CAPACITOR/FILTER TRENCH CPR04	TRENCH	CPR04	No	3	11.08	3.54			1	- 8	8 8	81 - Z				1	1	1	1
		-	-		S003-SSS-11SC-7HFYPROT	RELAY MULTIFUNCTION DIFF SIEMENS 75361	SIEMENS	75J61	No	2	-	+	11.08	5.54		-	-	+	-		6	-		1. 11,222	0,220
INTERFACE	ANALOG INTERFACE / YARD	x3+583	2008	3.43	SOUS-SSS-11SC-BISYARD	BINARY INTERFACE MODULE (SU200:8)	SIEMENS	50200	Yes	2					11.08	5.54				3.43	3.43	> 2043	2028/29 (6)	> 2043	> 2043
					SOD2455-115C-BISYARD	DINART INTERFACE MODULE (SU20015)		50200	Yes	2					11.08	3.34									
					SOUS-SSS-11SC-BISTARD	BINANT INTERFACE MODULE (SU200117)	DIEMENS	50200	Tes	2					11.08	5.54								4	

Objective ID:

1.0



	AP	PENDI)	(A -	S 0	03 GREENBANK	275KV SUBSTATION AND S	VC SECOND	ARY SYSTEMS	- EQUIP	MEN	NT H	EAL	TH IN	IDIC	CES A	ND	RECOM	MEN	DED	REPLACE	MENT TIM	EFRAN	1E		
Notes:	(a): Subject to Powerlink's O&M (b): Recommended Timeframe (c): Based on Visual Inspection (d): As a minimum requirement	/ Safety Req is based on and Subject , Rubber Se	uiremen majority to the d als, Air f	of Equ ecision	rent Standard Solutions and Im ipment Health Indices I of the Control Building and Sec Id Terminals and Links are requi	plementation Methodologies, It may be more beneficial ondary Systems Panels. A number of New Cables may b red to be repalced by the recommended timeframe. Ne	to align with the recom e requried if location o w Marshalling Kiosks sl	mended replacement timefr control building or seconda rould be considered if Exsitir	rame of sedondar ry systems panels ng Cables are to b	y system is chang e reapla	ns equipr ged. Iced.	ment										RECOMM Trigger C Solu	IENDED REPLAC conditions only, tions, implemen	EMENT TIMMI Exclude consident Exclude method	NG (Based on lerations for lologies)
BAY	C&P PA	NEL				SECONDARY SYSTEMS EQUIPMENT	5		1		Х-Р	ROT	Y-PR	ют	AUX 8	CTRL	REVENUE METERING	OF	SWAN	CABLES (HI)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chassis)	Sec Sys Eqiupment	CABLES	YARD MARSHALLIN G KIOSKS
Function	Panel Descripion	Panel No	. Year	н	Functional Loc.	Description	Manufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	e Eff. Age	н	Eff. Age	н	Eff. Age	н	Eff. Age HI	Eff. A	ge HI	C&P Panels to H Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, CODUNG)	Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	Yard Marshalling Kiosks (CR, MK, CT, VT, AC, DC, COOLING)
24VDC BINARY	24VDC BINARY INTERFACE	X4+SB4	2000	3.43	S003-SSS-11SC-BICOOL	INTERFACE MODULE (SU200:1)	SIEMENS	5U200	Yes	8					11.08	5.54		Ĩ.		3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
intresi dec					S003-SSS-11SC-BICTRLAN	BINARY INTERFACE MODULE (SU200:12)	SIEMENS	SU200	Yes	8					11.08	5.54									
					S003-SSS-11SC-BICTRLAN	BINARY INTERFACE MODULE	SIEMENS	SU200	Yes	2	ê	2		1	8.54	4.27	5 K	6	2						
					5003-SSS-11SC-BICTRLAN	BINARY INTERFACE MODULE	SIEMENS	SU200	Yes	8		Ĉ			8.54	4.27			-						
125VDC BINARY	125VDC BINARY INTERFACE	X5+SB5	2000	3.43	S003-SSS-11SC-BIPROT	BINARY INTERFACE MODULE (SU200:3)	SIEMENS	SU200	Yes	8					11.08	5.54				3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
INTERFACE					S003-SSS-11SC-BIPROT	BINARY INTERFACE MODULE (SU200:5)	SIEMENS	SU200	Yes	8	ĉ	2			11.20	5.60	5 8	6	8						
					5003-555-115C-BISTN	BINARY INTERFACE MODULE (SU200:14)	SIEMENS	SU200	Yes	2		2	· · · · ·	-	11.08	5.54	× ×	1	×	1					
SVC ODSWAN	SVC OBSWAN		201	2.00	SOOS SEE 1150 OWCOVERT	DC/DC CONVERTER	PHOENUV	OLUNT PS.100	No		51	2		-	2		-8	11.0		3.00	2.00	> 1049	2022/24/b)	> 2049	> 2048
STCOLOUR	STOOTSTICK				S003-SSS-11SC-OWINVERT	INVERTER 125VDC/240VAC 1600W	LATRONICS	415-BKZ-CN125	No	3	-	-		-	-	-	- K	11.0	8 5.54				20000/04(0)	12040	7 2040
					S003-SSS-11SC-OWNTWK	GEN 4 SERVER OPSWAN	Esis	EB15002	No	2	ŝ	2			8	8	â (j	2.36	1.96						
					S003-SSS-11SC-OWNTWK	LOCAL CONTROL FACILITY PC X TERMINAL	WYSE	7010	Yes	1								2.36	1.96	6					
					5003-555-115C-OWNTWK	CHECK POINT 1200R IPS RUGGED APPLIANCE	CHECKPOINT		No	2		8					25 - 8 	0.00	0.00	0					
					S003-SSS-11SC-OWPRINT	PRINTER	HEWLETT PACKARD	HP5200TN	Yes	0								11.0	8 9.23						
SVC COOLER CONTROL	SVC COOLER CONTROL PANEL	NE1+SN1	2008	3.43	S003-SSS-11SC-VCOOLCON	CONTROL UNIT	SIEMENS	SIMATIC TDC UR5213	No	2					16.67	8.33				3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
					S003-SSS-11SC-VCOOLCON	PROGRAMMABLE LOGIC CONTROLLER (2of)	SIEMENS	\$7300	3						11.08	5.54			0						



Note: Note: <th< th=""><th></th><th>APP</th><th>ENDIX</th><th>(A - 5</th><th>600</th><th>3 GREENBANK 2</th><th>75KV SUBSTATION AND SVC</th><th>SECONDA</th><th>RY SYSTEMS</th><th>- EQUIP</th><th>MEN</th><th>IT H</th><th>EAL</th><th>TH IN</th><th>DIC</th><th>ES AN</th><th>ND F</th><th>RECOM</th><th>MENDED</th><th>REPLACE</th><th>MENT TIN</th><th>EFRAN</th><th>1E</th><th></th><th></th></th<>		APP	ENDIX	(A - 5	600	3 GREENBANK 2	75KV SUBSTATION AND SVC	SECONDA	RY SYSTEMS	- EQUIP	MEN	IT H	EAL	TH IN	DIC	ES AN	ND F	RECOM	MENDED	REPLACE	MENT TIN	EFRAN	1E		
Part 10 Part 10 <t< td=""><td></td><td>(e): Subject to Powerlink's O&M</td><td>Safety Requ</td><td>uirements,</td><td>Curr</td><td>ent Standard Solutions and Imple</td><td>mentation Methodologies, it may be more beneficial to ali</td><td>gn with the recomm</td><td>ended replacement timefr</td><td>ame of sedondar</td><td>y system</td><td>is equip</td><td>pment</td><td></td><td></td><td></td><td></td><td></td><td>1.4.1</td><td></td><td></td><td>RECOMM</td><td>NENDED REPLAC</td><td></td><td>NG (Based on</td></t<>		(e): Subject to Powerlink's O&M	Safety Requ	uirements,	Curr	ent Standard Solutions and Imple	mentation Methodologies, it may be more beneficial to ali	gn with the recomm	ended replacement timefr	ame of sedondar	y system	is equip	pment						1.4.1			RECOMM	NENDED REPLAC		NG (Based on
USE UNIT NUMBER ALL PROPERTIES AND ALL PROPERTIE	Notes:	(c): Based on Visual Inspection a	nd Subject t	to the deci	sion o	pment Health Indices of the Control Building and Secon	dary Systems Panels. A number of New Cables may be rep	uried if location of c	ontrol building or seconda	ry systems danels	is chang	red.										Trigger C	conditions only,	Exclude consid	ierations for
Description		(d): As a minimum requirement,	Rubber Sea	is, Air fitte	rand	Terminals and Links are required	to be repaiced by the recommended timeframe. New Ma	rshalling Kiosks sho	uld be considered if Exsitin	g Cables are to b	e reapla	ced.										Solu	tions, implement	ntation method	lologies}
Decision Decision <th< th=""><th>-</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>REVENUE</th><th></th><th></th><th>YARD</th><th>C&P PANELS</th><th>Sec Sys</th><th></th><th>YARD</th></th<>	-																	REVENUE			YARD	C&P PANELS	Sec Sys		YARD
August	BAY	C&P PAN	EL				SECONDARY SYSTEMS EQUIPMENT					X-4	PROT	Y-PRO	п	AUX&C	TRL	METERING	OPSWAN	CABLES (HI)	MARSHALLING KIOSKS (HI)	(Chassis)	Eqiupment	CABLES	G KIOSKS
Duck Duck <th< td=""><td></td><td></td><td>1</td><td>TT</td><td></td><td></td><td></td><td>Î</td><td>1</td><td>1</td><td>1</td><td>1</td><td>Ť</td><td></td><td></td><td>T</td><td>- 1</td><td></td><td></td><td></td><td>income purp</td><td></td><td></td><td></td><td>C MOSKS</td></th<>			1	TT				Î	1	1	1	1	Ť			T	- 1				income purp				C MOSKS
Number Number<																								C&P Panels to	1.000
Norm Norm Norma N																				C&P Panels to H	Vard Marshalline		Sec Sus	HV Yard	Marshalling
Normal	Euclion	Panel Description	Senal No.	Ver		Functional Loc	Description	Manufacturar	Madeloumber	Obsolescence	Spare	Eff.		542 1.00			-		54 Are	Yard Marshallin	Kiosks (CB, MK,	CO.P. Camair	Equipment &	Marshalling Kincks (CR	Kiosks (CB,
No. 100	renction	Panel Description	rateria.	i tear	n.	Pariculation coc.	Description	manaracturer	wooernomper	(Yes / No)	Qty	Age		en. 46e	191	-11.06-	ru.	-ueu		CT, VT, AC, DC	CT, VT, AC, DC,	Carr Fallers	Auxiliary	MK, CT, VT,	MK, CT, VT,
Normal Processes Normal Processes<																				COOUNG)	COOLING		Components	AC, DC,	AC, DC, COOLING)
Normal Normal<																								COOLING	coocinoj
Linger 100 is the former owner in the forme					_										_						-				
Description: Description:<	1 BUS ZONE	275KV 1 BUS - BUS ZONE AND CB	+5811	2005 4	1.00 5	S003-SSS-1BUS-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C30	FOXBORD	CS0	Yes	15	12.50	4 5 77	Q - 4	<u> </u>	13.54	6.77		8	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
No. 100 No. 100 <t< td=""><td></td><td>AND CONTROL CUBICLE</td><td></td><td></td><td>5</td><td>5003-555-18U5-XPROT</td><td>RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13</td><td>AREVA</td><td>MVAJ13</td><td>No</td><td>18</td><td>13.54</td><td>4 6.77</td><td>2 0</td><td>. 6</td><td></td><td>- 22</td><td>1</td><td>6 3</td><td>-</td><td></td><td></td><td></td><td></td><td></td></t<>		AND CONTROL CUBICLE			5	5003-555-18U5-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	13.54	4 6.77	2 0	. 6		- 22	1	6 3	-					
Normal Normal<					2	SOOB-SSS-1BUS-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	13.54	4 6.77	3 - 5	i - 32		- 8		Q - QQ						
Number Numer Numer Numer <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>SOO3-SSS-1BUS-XPROT</td> <td>RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12</td> <td>AREVA</td> <td>MVAX12</td> <td>No</td> <td>9</td> <td>13.54</td> <td>4 6.77</td> <td></td> <td>-</td> <td></td>					1	SOO3-SSS-1BUS-XPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12	AREVA	MVAX12	No	9	13.54	4 6.77		-										
No. 16.1 No. 16.2					1 10	5003-555-18U5-XPROT	RELAY OB FAIL BUS TRIP RACK	RMS	CB FAIL TRIP RACK	No	3	13.54	4 6.77		-					-					
Internal base Internal					5	SOOB-SSS-1BU5-YPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4		18	13.54	6.77				8 80						
Normal Provision Control Contro Control Control Control Control Control Control Control					2	S003-SSS-1BUS-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA.	MVAJ13	No	18	-	10	13.54	6.77		- 3		2 3	_					
Normal Normal<					1	5003-555-18U5-YPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAS13	AREVA	MVAX12	No	- 10	-	- 25	13.54	6.77		8	5		-					
Normal Part of vol states and states Part of vol states Part of					5	5003-555-18U5-YPROT	RELAY CB FAIL BUS TRIP RACK	RMS	CB FAIL TRIP RACK	No	3		- 12	13.54	6.77		ii	8	2 Se						
Lingsom print (12): 4 ab of word prin (12): 4 ab of word print (12): 4 ab of word<					5	SOO3-SSS-18U5-YPROT	RELAY CB FAIL BUS TRIP RACK	RMS	CB FAIL TRIP RACK	No	3			13.54	6.77	_	_								
Perturba classi Perturba classi Pertur	1 BUS ZONE	273KV 1 BUS - BUS ZONE AND CB	+345	2007 3	3.71 5	5003-555-18U5-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13 MVAJ13	No	18	12.17	7 6.09	6 - 6					14 - 24 - 14 - 14 - 14 - 14 - 14 - 14 -	3.71	3.71	> 2042	2027/28 (b)	> 2042	> 2042
The last of		PROTECTION CUBICLE				5003-555-18U5-XPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12	AREVA	MVAX12	No	9	12.17	7 6.09	6 8	E 18		- 8		8 36	-					
Image: Provide control in the control in th		2910-002910929500329003			5	SOOB-SSS-1BUS-XPROT	RELAY CB FAIL BUS TRIP RACK	RMS	3A111K3	No	29	12.17	7 6.09	<u>5</u> - 3				- 8	ê 8						
Image: Second Conduct Second					1	5003-555-18U5-XPROT	RELAY CE FAIL BUS TRIP RACK RELAY TRIPPING LOW BURDEN ALSTOM MVALLS	RMS	3A111K3 MVAH3	No	29	12.17	7 6.09	12.17	6.09				2 2	-					
Set 304 Pite 1 80 - Rel 2000 00000000000000000000000000000000						5003-555-18U5-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAU13	AREVA	MVAJ13	No	18	1	13	12.17	6.09			- 3		-					
Image: Normal biology in the second secon					5	SOO3-SSS-18U5-YPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12	AREVA	MVAX12	No	9			12.17	6.09										
The Dort Provi State - les 200 MA 400 - State Diff The State - les 200 MA 400 - State Diff					1	SOO3-SSS-1BUS-YPROT	RELAY OB FAIL BUS TRIP RACK	RMS	3A111K3	No	29	-	- 14	12.17	6.09		- 1								
Nul bit MP () YM01TTON Null State () YM01TTON<	2 BUS ZONE	275KV 2 BUS - BUS ZONE AND CB	+5812	2007 3	3.71 5	5003-555-28U5-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	12.16	6 6.08	12.1/	0.03		- 2	8		3.71	3.71	> 2042	2027/28 (b)	> 2042	> 2042
MO CONTICL CURLE No Bits of the set of the		FAIL BUS TRIP X , Y PROTECTION	000000	13520152	-	SOO3-SSS-2BU5-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	12.16	6 6.08	d a			3		2 B	1999	States	0-5855	1211022-001	040837	85376238
Image: second		AND CONTROL CUBICLE			2	SOO3-SSS-2BUS-XPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12	AREVA	MVAX12	No	9	12.16	6 6.08							_					
Bit of the second sec						5003-555-28U3-XPROT 5003-555-28U3-XPROT	RELAY CE FAIL BUS TRIP RACK RELAY CE FAIL BUS TRIP RACK	RMS	3A111K3 3A111K3	No	29	12.16	6 6.08							-					
Image: State					1	SOO3-SSS-2BUS-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18			12.16	6.08				1						
Studie Studie<					5	SOO3-SSS-2BUS-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18		- 1	12.16	6.08	1	11	2	1 - Si						
Sub 2010 The state-bit 2010-2010-2010-2010-2010-2010 The state bit 2010 The state bit 2010 The state bit 2010 The state bit 2010-2010-2010-2010-2010-2010-2010-2010					2	5003-555-28U5-YPROT 5003-555-28U5-YPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12 RELAY CE FAIL BUS TRIP BACK	RMS	MVAX12 3A111K3	No	29	_	12	12.16	6.08		- 2		2 26	-					
Sind 2001 P39/ 31/ 31/-31/ 31/ 31/ 31/ 31/ 31/ 31/ 31/ 31/ 31/				2 2	5	5003-SSS-2BUS-YPROT	RELAY CB FAIL BUS TRIP RACK	RMS	3A111K3	No	29		12	12.15	6.08	1		1	1 2	6				c – 2	
PAGE bit THIP AND '	2 BUS ZONE	275KV 2 BUS - BUS ZONE AND CB	+5A6	2006 4	1.00 5	SOOB-SSS-2BUS-BAYCONT	REMOTE TERMINAL UNIT FOXBORO CSO	FOXBORO	C50	Yes	15	_	-		_	13.54	6.77			4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
Distribution Distribution<		FAIL BUS TRIP X AND Y				5003-555-28U5-XPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4	13.54	4 6.77	1			- 8	8		_					
Display Display Display Nature is a large and large and large and is a large and large and is a large and large		Photechion coolce			1	5003-555-28U5-XPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	13.54	4 6.77	Ŭ Ť			- C	0		-					
Description Description Build of the Autor Market Au					5	5003-SSS-2BUS-XPROT	RELAY TRIPPING SUPPLY FAIL ALSTOM MVAX12	AREVA	MVAX12	No	9	13.54	4 6.77	0 0		1	11	2	1 St.						
Image: Construction of the construction of					100	5003-555-28U5-XPROT 5003-555-28U5-XPROT	RELAY CE FAIL BUS TRIP RACK RELAY CE FAIL BUS TRIP BACK	RMS	CB FAIL TRIP RACK	No	3	13.54	4 6.77	e 9					2 2	_					
Image: bit is a constraint of the constrain					5	SOO3-SSS-2BUS-YPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA.	MFAC34	No	4			13.54	6.77		2	1		-					
Diametres 10 279 NV eC10-QD COUPLER X, Y 458.4 2000 4355 380.5 **** 148.4 143.4 6.73 1 133.4 6.77 1 1 133.4 6.77 1 1 133.4 6.77 1 1 133.4 6.77 1 1 133.4 6.77 1 <t< td=""><td></td><td></td><td></td><td></td><td>2</td><td>S003-SSS-2BU5-YPROT</td><td>RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13</td><td>AREVA</td><td>MVAJ13</td><td>No</td><td>18</td><td></td><td></td><td>13.54</td><td>6.77</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>					2	S003-SSS-2BU5-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18			13.54	6.77										
Image: Construct of the consthe construct of the construct of the construct of the co					1	5003-555-28U5-YPROT	RELAY TRIPPING LOW BURDEN ALSTOM MVAJ13	AREVA	MVAJ13	No	18	-	18	13.54	6.77					_					
Image: Note: The sector sect						SOO3-SSS-2BUS-YPROT	RELAY CB FAIL BUS TRIP RACK	RMS	CB FAIL TRIP RACK	No	3		1	13.54	6.77					-					
DIAMETER 10 COUPLER 273W vello-30 COUPLER X, Y FOTECTION AND CONTROL CUBICLE 1 + 3 b COUPLER X, Y FOTECTION AND CONTROL CUBICLE 2006 + 400 COUPLER X, Y FOTECTION AND CONTROL CUBICLE 1 + 3 b COUPLER X, Y FOTECTION AND CONTROL CUBICLE 1 + 3 b COUPLER X, Y FOTECTION AND CONTROL CUBICLE 2006 + 2000 + 200					s	SOO3-SSS-2BU3-YPROT	RELAY CB FAIL BUS TRIP RACK	RMS	CB FAIL TRIP RACK	No	3	1	18	13.54	6.77	- 21		8	1 A						
COUPLER PROJECTION ARCOUNTAGE Couples	DIAMETER 10	275KV =C10-Q30 COUPLER X, Y	+5A8	2006 4	1.00 5	S003-SSS-5010-BAYCONT	REMOTE TERMINAL UNIT FOXBORD C50	FOXBORO	C50	Yes	15	1.1.1.1			_	13.46	6.73			4.00	4.00	> 2041	2026/27 [b]	> 2041	> 2041
Image: Note: 1 State: 500::00::00::00::00::00::00::00::00::0	COUPLER	CUBICLE			1	5003-555-5010-YPROT	RELAY CB MGMT SEL 352 1A, 125Vdc, 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	5	12,40	0 0.25	13.46	6.73		- 8	1		_					
Image: Control in the state of the		25402-457272			5	5003-555-5010-YPROT	FEEDER B36 SIT A (Y)	DEWAR	DM1200 DIGITAL	Yes	10			13.46	6.73										
DiAMETER 11 275/V =C11-G30 COUPLER X, Y 5A11 2004 4.00 5003-555-501-98A VCONT REMOTE TERMINAL UNIT FOXBORO C30 POXBORO C30 Yes 15 13.3 6.77 14.33 6.77 4.00 4.00 > 2041 2026/27 [b] > 2041 DIAMETER 11 275/V = C12-G30 COUPLER X, Y F5A11 2006 4.00 5003-555-501-980 / RMOTE TERMINAL UNIT FOXBORO C30 FOXBORO C30 Yes 9 13.33 6.77 1<					s	5003-555-5010-YPROT	FEEDER 836 SIT B (Y)	RFL ELECTRONICS	9745 DIGITAL	Yes	0			13.46	6.73		1								
COUPLER PROTECTION AND CONTROL CUBILE 2003-255-011-XPROT RELAY CB MGMT GE C60 (VER 2.93) Yes: 9 13.33 6.77 0	DIAMETER 11	275KV =C11-Q30 COUPLER X. Y	+5A11	2005 4	1.00 5	SOOB-SSS-5011-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C30	FOXBORO	C50	Yes	15	1				13.53	6.77			4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
Cusicus Coloradia Soloradia	COUPLER	PROTECTION AND CONTROL			5	5003-555-5011-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	. 9	13.53	3 6.77	11 11		Ĵ.	11		-0 BC				8.39		
COUPLER PROTECTION AND CONTROL Cold Cold TEs 13	DIAMETER + 2	CUBICLE	+5010	3000	5	5003-555-5011-YPROT	RELAY CB MGMT SEL 352 1A, 125Vdc, 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	3	-	-	13.53	6.77	12.54	6.77			1.00	100	1 2044	2026/22 01	. 2044	
CUBICLE S003-555-0012-YPROT RELAY CB MGMT SEL 332 1A, 125VeC, 4U SCHWEITZER SEL-332 (IA)(4U) No S 9.81 4.91 O SO SO<	COUPLER	PROTECTION AND CONTROL	+3A14	2006 4	.00 5	5005-555-5012-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	15	13.54	4 6.77			15.34	0.//			4.00	4.00	> 2041	2026/2/ (b)	> 2041	> 2041
Diameter is coupler 273/v = cl3-gas coupler, x, y protection and control cubicle 4642 2007 3.72 3.72 3.72 3.71 > 2042 2027/28 [b] > 2042 Coupler Protection and control cubicle 000-355-3013-XPROT BLAY CB MORT GE Colver LES 39 FIRMINAL UNIT FOXBORO C30 FOXBORO C30 Yes 15 12.16 6.06 1 1 3.71 > 2042 2027/28 [b] > 2042 2	100000000000000000000000000000000000000	CUBICLE			5	5003-555-5012-YPROT	RELAY CB MGMT SEL 332 1A, 125Vdc, 4U	SCHWEITZER	SEL-332 (1A) (4U)	No	5			9.81	4.91		Ĩ								
Objective ID: Version No: 1.0 Issue Date: 27/02/20	DIAMETER 13	275KV =C13-Q30 COUPLER X, Y	+6A2	2007 3	3.71 5	S003-SSS-5013-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C30	FOXBORO	C50	Yes	15					12.16	6.08			3.71	3.71	> 2042	2027/28 (b)	> 2042	> 2042
S003-555-5013-VPROT BAY =C13-Q30 X PROT COUPLER CE FOR B848 SIT 6 RFL ELECTRONICS 9745 DiGITAL Yes 0 12.16 6.08 0 Objective ID: FOA Version No: 1.0 Issue Date: 27/02/20 12.16 6.08 12.16 12.16 6.08 12.16	UDUPLER.	CUBICLE			100	5005-355-5013-XPROT 5003-555-5013-XPROT	BAY =C13-030 X PROT COUPLER CB FDR 8848 SIT A	DEWAR	DM1200 DIGITAL	Yes	10	12.16	6 6.08		-		- 2	8	8 8			1			1
Objective ID: Version No: 1.0 Issue Date: 27/02/20					5	5003-555-5013-XPROT	BAY =C13-Q30 X PROT COUPLER CB FOR 8848 SIT 8	RFL ELECTRONICS	9745 DIGITAL	Yes	0	12.16	6 6.08							1		1	1		1
Objective ID: Version No: 1.0 Issue Date: 27/02/20				Ļ	5	5003-555-5013-YPROT	RELAY CB MGMT SEL 332 1A, 125Vdc, 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	5			12.16	6.08						L	Ļ	L		_
	Objectiv	/e ID:				Version N	o: 1.0	Issue E	Date: 27/02/20)															



	APP	ENDI)	(A -	S0(03 GREENBANK 2	75KV SUBSTATION AND SVC	SECONDA	RY SYSTEMS	- EQUIP	MEN	T HI	EAL	TH IN	DIC	ES AI	ND	RECOM	MENDE	REPLACE	MENT TIN	IEFRAN	1E		
Notes:	(a): Subject to Powerlink's O&M (b): Recommended Timeframe is (c): Based on Visual Inspection a (d): As a minimum requirement	Safety Req s based on i nd Subject i Rubber Sec	uirement najority to the de us Air fil	ts, Cur of Equ ecision	rrent Standard Solutions and Imple upment Health Indices of the Control Building and Secon of Terminals and Links are renuised	mentation Methodologies, it may be more beneficial to all dary Systems Panels. A number of New Cables may be req in the renalized by the recommended timeframe. New Ma	gn with the recomm uried if location of co urballing Kinsks, the	ended replacement timefr ontrol building or secondar	ame of sedondary ny systems panels ny Cables are to by	system is chang	s equipn jed.	ment									RECOMM Trigger C Solut	IENDED REPLAC Conditions only, tions, implement	EMENT TIMMIN Exclude consid	VG (Based on erations for ologies)
BAY	C&P PAN	EL				SECONDARY SYSTEMS EQUIPMENT					X-P	ROT	Y-PR	от	AUX &	CTRL	REVENUE METERING	OPSWAN	CABLES (HII)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chassis)	Sec Sys Eqiupment	CABLES	YARD MARSHALLIN G KIOSKS
Function	Panel Descripion	Panel No	Year	H	Functional Loc.	Description	Manufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	Eff. Age	н	Eff. Age	н	Eff. Age	н	Eff. Age HI	Eff. Age 🚺	C&P Panels to F Yard Marshallin II Kiosks (CB, MK CT, VT, AC, DC COOLING)	V Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	Yand Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)
DIAMETER 14	275KV =C14-Q30 COUPLER X, Y	+6A5	2007	3.71	S003-SSS-5014-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15					12.91	6.45			3.71	3.71	> 2042	2027/28 (b)	> 2042	> 2042
COUPLER	PROTECTION AND CONTROL				S003-SSS-5014-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	12.16	6.08	. S	- 2	8		. š	1 S						
	CUBICLE				5003-555-5014-XPROT 5003-555-5014-XPROT	BAY C=14-Q30 X PROT COUPLER CB FDR 3849 SIT A	RFL ELECTRONICS	9745 DIGITAL	Yes	0	12.10	6.08	2 (3)	- 22	8 1	Q Q	: 8	8 8						
	1911 I I I I I I I I I I I I I I I I I I				5003-555-5014-YPROT	RELAY CB MGMT SEL 352 1A, 125Vdc, 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	5		-	12.16	6.08	2		· 8	1 ×	-					
DIAMETER 4	275KV =C04-Q30 COUPLER X, Y	+4A6	2006	4.00	S003-SSS-504-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15	anceres.	harris	1 6	13	13.54	6.77			4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
COUPLER	PROTECTION AND CONTROL				5003-555-504XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.54	6.77	12.54	6.77	80000	6	8	8				0.000		
	CODICLE				5003-555-504YPROT	BAY C=04-Q30 Y PROT COUPLER CB FDR 8824 SIT A1	DEWAR	DM1200 DIGITAL	Yes	10			13.54	6.77	ž i		i i	1	-					
					5003-555-504YPROT	BAY C=04-Q30 Y PROT COUPLER CB FDR 8824 SIT A2	RFL ELECTRONICS	9745 DIGITAL	Yes	0			13.54	6.77										
					S003-SSS-504YPROT	BAY C=04-Q30 Y PROT COUPLER CB FDR 8824 SIT B1	DEWAR	DM1200 DIGITAL	Yes	10			13.54	6.77			i D							
					S003-SSS-504YPROT	BAY C=04-Q30 Y PROT COUPLER CB FDR 8824 SIT B2	RFL ELECTRONICS	9745 DIGITAL	Yes	0		1 - C	13.54	6.77		1	· · · · ·							
DIAMETER 5	275KV =C05-Q30 COUPLER X. Y	+449	2006	4.00	S003-SSS-505BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15				- 13	13.53	6.77	8	1	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
COUPLER	PROTECTION AND CONTROL	242123	05555		S003-SSS-505XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.53	6.77	· · · · ·							12,262,20	10.00000	202020420	2012/07/07	202020
	CUBICLE				S003-SSS-S05-XPROT	BAY C=05-Q30 X PROT COUPLER CB FDR 8822 SIT A	RFL ELECTRONICS	9745 DIGITAL	Yes	0	13.53	6.77	3 (3	- 22	8	÷ • •		8						
					\$003-\$\$\$-505-XPROT	BAY C=05-Q30 X PROT COUPLER CB FDR 8822 SIT B	DEWAR	DM1200 DIGITAL	Yes	10	13.53	6.77	2 - 63	- 23	8 3	Q - 2	: 8	8 8						
					S003-SSS-505-YPROT	RELAY CB MGMT SEL 352 1A, 125Vdc, 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	5			13.53	6.77	8 1		3	3						
					S003-SSS-505YPROT S003-SSS-505YPROT	BAY C=05-Q30 Y PROT COUPLER CB FDR 8825 SIT A1 BAY C=05-Q30 Y PROT COUPLER CB FDR 8825 SIT A2	DEWAR RFL ELECTRONICS	DM1200 DIGITAL 9745 DIGITAL	Yes	10 0	-	0	13.53 13.53	6.77 6.77	. .				-					
					S003-SSS-505-YPROT	BAY C=05-Q30 Y PROT COUPLER CB FDR 8825 SIT B1	DEWAR	DM1200 DIGITAL	Yes	10	1	10 1	13.53	6.77	8 1	6 8		1 8	-					
					S003-SSS-505-YPROT	BAY C=05-Q30 Y PROT COUPLER CB FDR 8825 SIT B2	RFL ELECTRONICS	9745 DIGITAL	Yes	0			13.53	6.77			0				1. 2-240			
DIAMETER 6	275KV =C06-Q30 COUPLER (CB	+4A12	2006	4.00	S003-SSS-506-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15			1 - 8	3	13.46	6.73	200	1	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
COUPLER	CONTROL CUBICLE				5003-555-506XPRO1	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE) BAY C=06-030 X PROT COUPLER C8 EDR 205 SIT A	GE DEWAR	DM1200 DIGITAL	Yes	10	13.46	6.73	<u>i 8</u>	- <u>X</u>	<u> </u>	8 8	i i i	i č	_					
	1				S003-SSS-506XPROT	BAY C=06-Q30 X PROT COUPLER C8 FDR 805 SIT 8	RFL ELECTRONICS	9745 DIGITAL	Yes	0	13.46	6.73												
					S003-SSS-506YPROT	RELAY CB MGMT SEL 352 1A, 125Vdc; 4U	SCHWEITZER	SEL-352 (1A) (4U)	No	5		1	13.46	6.73	~									
					S003-SSS-506YPROT	BAY C=06-Q30 Y PROT COUPLER CB FDR 835 SIT A	DEWAR	DM1200 DIGITAL	Yes	10		12	13.46	6.73	<u>i</u>		. S.							
					S003-SSS-506YPROT	BAY C=06-Q30 Y PROT COUPLER CB FDR 835 SIT B	RFL ELECTRONICS	9745 DIGITAL	Yes	0			13.46	6.73										
DIAMETER 14	275KV =C14-Q20 5VC (CB 58112	+6A6	2008	3.43	S003-SSS-5811-BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15		3 3	2 8	- 3	11.08	5.54	i S	8	3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
SVC 2 BUS FDR	X, Y PROTECTION AND CONTROL				5003-555-5811-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	11.08	5.54			~	_								
DIAMETER & CAP	CUBICLE 275KV =008-010/08 58321 CAP	+583	2006	4.00	S003-SSS-5811-YPROT S003-SSS-583-BAYCONT	RELAY CB MGMT SEL 352 1A, 125Vdc, 4U REMOTE TERMINAL UNIT FOXBORO CS0	SCHWEITZER FOXBORO	SEL-352 (1A) (4U)	No	15	<u> </u>	1	11.08	5.54	13.46	6.73	8	8	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
3 (1 BUS)	3 X, Y PROTECTION AND				\$003-\$\$\$-583POWAVE	RELAY POINT ON WAVE ABB E213	ABB	SWITCHSYNC E213	Yes	0		1	1	- 3	13.46	6.73	e i č	Č.				Torreit av fai		
100000000000	CONTROL CUBICLE				5003-555-583XPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4	13.46	6.73		0	~		. D							
					S003-SSS-583-XPROT S003-SSS-583-XPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE) RELAY CAP PROTN ABB SPAJ160C (B PHASE)	ABB	SPAJ160C	No	3	13.46	6.73	<u>i</u> 3	- 35	3		<u> </u>	1 <u>1</u>	-					
					\$003-\$\$\$-583-XPROT	RELAY CAP PROTN ABB SPAJ160C (C PHASE)	ABB	SPAJ160C	No	3	13.46	6.73	8 - S		8 1	8 8	8	8						
					5003-555-583-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.46	6.73	3	- 3	ž – 1	6 6								
					\$003-\$\$\$-583YPROT \$003-\$\$\$-583YPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE) RELAY CAP PROTN ABB SPAJ160C (B PHASE)	ABB	SPAJ160C	No	3	_	12	13.46	6.73	2	2 2	2	1 E	-					
					SO03-SSS-583-YPROT	RELAY CAP PROTN ABB SPAJ160C (C PHASE)	ABB	SPAJ160C	No	3			13.46	6.73										
					S003-SSS-583YPROT	RELAY CBMAN SEL-351-1 (1A)	SCHWEITZER	SEL-351-1 (1A)	Yes	11		15 1	13.46	6.73	8	ŝ 3	1				<			
4 (2 BUS)	275KV =CUB-Q20 CAP 4 X, Y PROTECTION AND CONTROL	+584	2006	4.00	5003-555-584BAYCONT 5003-555-584POWAVF	REMOTE TERMINAL UNIT FUXBORD C50 RELAY POINT ON WAVE ABB F213	ABB	SWITCHSYNC F213	Yes	15		1.		5	13.46	6.73	2		4.00	4.00	> 2041	» 2041 2026/27 (b)		> 2041
100000	CUBICLE				S003-SSS-584XPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4	13.46	6.73					2	<u> </u>						
					5003-555-584XPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE)	ABB	SPAJ160C	No	3	13.46	6.73	1 S	2	§ _]	8 8		1	_					
					5005-555-584-XPROT 5003-555-584-XPROT	RELAY CAP PROTN ABB SPAULOC (B PHASE)	ABB	SPAJ160C	No	3	13.46	6.73	2 2	- 2	S :		- S	3	-					
		1			S003-SSS-584-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.46	6.73		1	ě i	8 8	. Š	i i			I I	1	1	1
					S003-SSS-584YPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE)	ABB	SPAJ160C	No	3			13.46	6.73					_					
		1			5005-555-584TPROT 5003-555-584YPROT	RELAT CAP PROTN ABB SPAUIDOC (8 PHASE)	465	SPAILOUC SPAILOUC	No	3	-		13.46	6.73	2		- <u>1</u>		-		I I	1	1	1
					S003-SSS-584-YPROT	RELAY CBMAN SEL-351-1 (1A)	SCHWEITZER	SEL-351-1 (1A)	Yes	11		8 3	13.46	6.73	8 - 1	ŝ - ŝ		1						

Objective ID:

A44748633322 504 Version No:

Issue Date: 27/02/20

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	APP	ENDIX	Α.	S0(03 GREENBANK 2	75KV SUBSTATION AND SVO	SECONDA	RY SYSTEMS	- EQUIP	MEN	T HI	EAL	TH IN	DIC	ES A	ND F	RECOM	MENDE	DR	EPLACEN	MENT TIM	EFRAN	IE		
Notes:	(a): Subject to Powerlink's O&M (b): Recommended Timeframe i (c): Based on Visual Inspection a (d): As a minimum requirement,	Safety Requ s based on n nd Subject t Rubber Sea	irement najority (o the de Is, Air fill	ts, Cur of Equ cision ter an	rrent Standard Solutions and Imple sigment Health Indices of the Control Building and Secon d Terminals and Links are required	ementation Methodologies, it may be more beneficial to : ndary Systems Panels. A number of New Cables may be re d to be repalced by the recommended timeframe. New N	lign with the recomm quried if location of c farshalling Kiosks sho	ended replacement timefr ontrol building or seconda uld be considered if Exsitir	ame of sedondar ny systems panels ng Cables are to b	y system is chang e reaplac	s equipr ed. æd.	ment							_			RECOMM Trigger C Solut	ENDED REPLAC onditions only, tions, implemen	EMENT TIMMIN Exclude consident station methodo	IG (Based on erations for ologies)
BAY	C&P PAN	EL				SECONDARY SYSTEMS EQUIPMENT	11/	14	-1		Х-Р	ROT	Y-PR	то	AUX &	CTRL	REVENUE METERING	OPSWA	N	CABLES (HI)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chassis)	Sec Sys Eqiupment	CABLES	YARD MARSHALLIN G KIOSKS
Function	Panel Descripion	Panel No.	Year	Ħ	Functional Loc.	Description	Manufacturer	Model number	Obsolescence {Yes / No}	Spare Qty	Eff. Age	н	Eff. Age	н	Eff. Age	н	Eff. Age Hi	Eff. Age	HI	C&P Panels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, CODLING)	Yand Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)
DIAMETER 15	275KV =C15-O10 CAP 5 X, Y	+647	2007	3.71	S003-SSS-585BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15	-	-	i i	-	12.17	6.09	<u> </u>	-	-+	3.71	3.71	> 2042	2027/28 (b)	> 2042	> 2042
CAP 5 (1 BUS)	PROTECTION AND CONTROL				S003-SSS-585POWAVE	RELAY POINT ON WAVE ABB E213	ABB	SWITCHSYNC E213	Yes	0	S		S - S	1 2	12.17	6.09	8 8	5 5					202//20 (0)		
1000 0.00 0.00 0.00	CUBICLE				S003-SSS-585XPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4	12.17	6.09	1			X+2-1X-0	<u> </u>	1							
					S003-SSS-585XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	12.17	6.09	3 - 8	1 3	8 8	1	<u> </u>	13 S							
					5003-555-585XPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE)	ABB	SPAJ160C	No	3	12.17	6.09	2 0		a a		2 2		-						
					5003-555-585XPROT	RELAY CAP PROTN ABB SPAJ160C (C PHASE)	ABB	SPAJ160C	No	3	12.17	6.09	1 8		2 3		<u>è è</u>	1 8	-						
					S003-SSS-585YPROT	RELAY CBMAN SEL-351-1 (1A)	SCHWEITZER	SEL-351-1 (1A)	Yes	11			12.17	6.09											
					5003-SSS-585YPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE)	ABB	SPAJ160C	No	3	8	2	12.17	6.09	8	1 - 33	ų – į	1 8							
					S003-SSS-585YPROT	RELAY CAP PROTN ABB SPAJ160C (B PHASE)	ABB	SPAJ160C	No	3	_	-	12.17	6.09	8 8				-						
DIAMETER 15	2758V -C15-020 CAP 6 V V	1649	2007	3 71	S003-SSS-585YPROT	RELAY CAP PROTN ABB SPAJ160C (C PHASE)	ABB	SPAJ160C	No	3	6	8	12.17	6.09	12.16	6.08		1 8	-	3.71	3.71	> 20/2	2027/28 (5)	~ 2042	> 2042
CAP 6 (2 BUS)	PROTECTION AND CONTROL	TOHO	2007	3.71	5003-555-586POWAVE	RELAY POINT ON WAVE ABB E213	ABB	SWITCHSYNC E213	Yes	0		8	1 3		12.16	6.08	8 8	1 2	-	3./1	3.71	> 2042	2027/28 (0)	> 2042	> 2042
	CUBICLE				5003-555-586XPROT	RELAY DIFF AREVA MFAC34 RANGE: 25-325VAC	AREVA	MFAC34	No	4	12.16	6.08	i i			0.00		Ŭ							
	100000				5003-555-586XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	12.16	6.08	3 - 8	i (S	ŝ - ŝ	S	Ş 3	1 - B							
					S003-SSS-586XPROT	RELAY CAP PROTN ABB SPAJ160C (A PHASE)	ABB	SPAJ160C	No	3	12.16	6.08			2 4				-						
					5003-555-586XPROT	RELAY CAP PROTN ABB SPAJ160C (B PHASE)	ABB	SPAJ160C	No	3	12.16	6.08	3 - 8	(- 2)	8 8	- 8	<u>8 6.</u>	3 8							
					5003-555-586YPROT	RELAY CAP PROTIN ABB SPATIGOC (C PHASE)	ABB	SPAI160C	No	3	12.10	0.00	12.16	6.08	8 8	1	8		-						
					S003-SSS-586YPROT	RELAY CAP PROTN ABB SPAJ160C (B PHASE)	ABB	SPAJ160C	No	3		0	12.16	6.08	1	- Ü									
					S003-SSS-586YPROT	RELAY CAP PROTN ABB SPAJ160C (C PHASE)	ABB	SPAJ160C	No	3	3	8	12.16	6.08	8 8	- 8	Ş. Ş.	3 8	-						
					S003-SSS-586YPROT	RELAY CBMAN SEL-351-1 (1A)	SCHWEITZER	SEL-351-1 (1A)	Yes	11		~	12.16	6.08					_						
DIAMETER 15	275KV =C16-Q20 CAP 8 X, Y	+649	2009	3.14	5003-555-588BAYCONT	REMOTE TERMINAL UNIT FOXBORO CS0	FOXBORO	C50 SWITCHSVNC E213	Yes	15	0	- 3	2 3	2	10.40	5.20	S 31	0 8	-	3.14	3.14	> 2044	2029/30 (6)	> 2044	> 2044
CAPO	CUBICLE				5003-555-588XPROT	RELAY CAP PROTN ABB SPA1160C	ABB	SPAIL60C	No	3	10.40	5.20	8 8		10.40	3.20	<u> </u>	1 8	-						
	Contraction and				S003-SSS-588XPROT	RELAY CAP PROTN ABB SPAJ 160C	ABB	SPAJ160C	No	3	10.40	5.20	1		i i										
					5003-555-588XPROT	RELAY CAP PROTN ABB SPAJ 160C	ABB	SPAJ160C	No	3	11.21	5.61	8 - B	1 8	8	- 8	S - S -	2 B	- 1						
					S003-SSS-588XPROT	RELAY C8 MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	10.60	5.30			-										
					5003-555-588XPR01	RELAY DIFF ALSTOM MFAC34 RANGE 25-325VAC	ALSTOM	MFAC34	No	4	10.40	5.20	10.40	5 20	5 5	1 - B	5 5	2 8	-						
					5003-555-588YPROT	RELAY CAP PROTN ABB SPAJ160C	ABB	SPAJ160C	No	3		Ĩ.	10.40	5.20	<u>i</u> 1	- 5	<u> </u>	6 8	-						
					S003-SSS-588YPROT	RELAY CAP PROTN ABB SPAJ160C	ABB	SPAJ160C	No	3	1	-	10.40	5.20					-						
					S003-SSS-588YPROT	RELAY CB MGMT SEL-451 1A, 125VDC	SCHWEITZER	SEL-451 (1A)	Yes	23	С.		10.40	5.20	65 0-	- S	e 9.	0 8							
51111FTFF 10			2005	1.00			FOURCES				-	22			13.16	6.77			-		1.00	2011	202020201	2014	10/1
FEEDER 1	(SPARE) X, Y PROTECTION AND	+SA/	2006	4.00	5003-555-597BATCONT 5003-SSS-597(PROT	CURR DIFF RELAY MICOM PS44 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Vec	15	13 53	6 77	a <u>8</u>	- 2	13.46	0./5	8 8	2 8	-	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
(SPARE) (SPARE)	CONTROL CUBICLE				5003-SSS-597XPROT	COMMS INTERFACE UNIT ALSTOM P591	AREVA	P591 (50VDC)	Yes	90	13.46	6.73	9 B		8 8		8 8								
The Maria Softworks	0000.040.000.000.0000.0000.000				S003-SSS-597YPROT	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7			12.19	6.10	1	- 0	1 1								
				2.2	S003-SSS-597YPROT	A11	SCHWEITZER	SEL 2506	No	1	ĝ.	8	0.00	0.00	1		8 8	9 B	_		3			3	
DIAMETER 06 -	275KV =C06-Q10 FEEDER 805	+4A11	2006	4.00	S003-SSS-805BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15	8	8	a 8		13.46	6.73	a a.	0 8	-	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER 805	AND CONTROL CUBICLE				2002-202-202-202-202-202-202-202-202-20	DEWAR DM1200 PROT 313 DIG 50-320V SUPPLY	DEWAN	DWIZOUDIGITAL	ies	10					13.25	0.02			_						
					SO03-SSS-805PSSITB	RFL 9745 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	8					13.25	6.62									
					S003-SSS-805XPROT	RELAY C8 MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.46	6.73	1	1 2	1	1			_						
					5003-555-805XPRO1	CLIPP DIFF GE L90 21 HOU NOU-SXX-U61-W/R	GE	190 21 : HOU NEU UET	No	0	15.98	6.99	13.46	6.73	3 3		e e.	8 8	-						
					5003-555-805YPROT	COMMS INTERFACE UNIT ALSTOM P591	AREVA	P591 (50VDC)	Yes	90	2	1	13.46	6.73	1	-	<u> </u>	1 1	-						
DIAMETER 06 -	275KV =C06-Q20 FEEDER 835	+4413	2006	4.00	S003-SSS-835BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	15		2	6 6		13.46	6.73		S (4		4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER 835	(MUDGEERABA) X, Y PROTECTION AND CONTROL				SOO3-SSS-835PSSITA	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10					13.26	6.63				100000	1000 A	n stretch-	1		- characterick
	CUBICLE				SOO3-SSS-835PSSITB	RFL 9745 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0					13.26	6.63									
					S003-SSS-835XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.46	6.73			0										
					5003-555-835XPROT	RELAY DIFF GE L90 2T H00 N6U-SXX-U6T-W7R	GÉ	L90 2T : H00 N6U U6T	No	7	13.98	6.99	12.46	6.72	2 X	- 2	<u>2</u>		-						
					S003-SSS-835YPROT	COMMS INTERFACE UNIT ALSTOM P591	AREVA	P591 (50VDC)	Yes	90	3	8	13.46	6.73	8 9	- 8	8 8	1							

Objective ID:

1.0



	APP	ENDIX	Α.	SO	03 GREENBANK 2	75KV SUBSTATION AND SVC	SECONDA	ARY SYSTEMS	- EQUIP	MEN	NT H	EAL	TH IN	NDIC	ES A	ND	RECO	MME	NDED	REPLACE	MENT TIN	EFRAM	/E		
Notes:	 (a): Subject to Powerlink's O&M (b): Recommended Timeframe i (c): Based on Visual Inspection a (d): As a minimum requirement, 	I Safety Requ is based on n and Subject t Rubber Sea	irement hajority o the de Is, Air fit	of Equ cision ter an	rrent Standard Solutions and Imple sigment Health Indices of the Control Building and Secor of Terminals and Links are required	ementation Methodologies, it may be more beneficial to a ndary Systems Panels. A number of New Cables may be re- d to be repaiced by the recommended timeframe. New M	ign with the recomm quried if location of c arshalling Kiosks sho	rended replacement timef control building or seconda build be considered if Exsiti	rame of sedondar iry systems panel ng Cables are to t	ry system s is chanj se reapla	ns equipi ged. iced.	ment										RECOMM Trigger (Solu	MENDED REPLAC Conditions only, itions, implement	EMENT TIMMI Exclude consid ntation method	NG (Based on lerations for lologies)
BAY	C&P PAN	ÆL		-		SECONDARY SYSTEMS EQUIPMENT					X-F	PROT	Y-PF	ROT	AUX 8	CTRL	REVENU	E G	PSWAN	CABLES (HI)	YARD MARSHALLING KIOSKS (HI)	CB.P PANELS (Chassis)	S Sec Sys Eqiupment	CABLES	YARD MARSHALLIN G KIOSKS
Function	Panel Descripion	Panel No.	Yesr	н	Punctional Loc.	Description	Manufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	err. Age	н	Eff. Age	н	Eff. Age	Ħ	Eff. Age	ні ет.	45e HI	C&P Panels to H Yard Marshalin Kiosks (CB, MK, CT, VT, AC, DC, COOUNG)	V Yard Marshalling Kiosks (CB, MK, CT, VT, AC, OC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshalling Klosks (CB, MK, CT, VT, AC, DC, COOLING)	Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)
DIAMETER 10 -	275KV =C10-Q20 FEEDER 836	+5A9	2006	4.00	5003-555-836BAYCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	13					13.46	6.73				4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER 836	PROTECTION AND CONTROL				5003-555-836PMU	RELAY CB MGMT SEL-451-5 1A, 125VDC	SCHWEITZER	SEL-451-5 (1A)	NO	1					7.25	3.62			1						
	CUBICLE				5003-555-836P5PITY	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10					13.24	6.62				1					
					5003-555-836P55/TA	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10	1	-	-	8 8	13.24	6.62	S (1	-	3	- é					
											_			-				_							
					5003-555-836PSSITB	RFL 9743 PROT SIG DIG (/0 48-125V	RFL ELECTRONICS	9743 DIGITAL	Yes	0	1	1			13.24	6.62			1						
					5003-555-836XPROT	CURR DIFF RELAY MICOM P344 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9	13.46	6 6.73		2 2	2	8	<u>.</u>		- 3						
					5003-555-836XPROT 5003-555-836YPROT	COMMS INTERFACE UNIT ALSTOM P391 RELAY DISTANCE SCHW'ZER 421-3 1A 24 LED	AREVA SCHWEITZER	P591 (50VDC) SEL-421-5 (1A) (5U)	Yes	90	13.46	6 6.73	9.00	4.50	8	-	-	_	-2	-					
		42						1 14 1										_					e 10 500		
DIAMETER 04 - FEEDER 8813	275KV =C04-Q10 FEEDER 8813 (LOGANLEA) X, Y PROTECTION	+4A3	2005	4.00	5003-555-8813-BAYCONT 5003-555-8813-XPROT	REMOTE TERMINAL UNIT FOXBORD C50 RELAY CB MGMT GE C60 (VER 2 93 FIRMWARE)	FOXBORO	C50 C60 (VER 2.93)	Yes	13	13 54	4 6.77		8 9	13.54	6.77	19 A	- è	- 22	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
	AND CONTROL CUBICLE				5003-555-8813-XPROT	RELAY ABB RED670 REM END CCIS IPASS 6I6U	ABB	RED670 REM END CCIS	No	4	14.25	5 7.12	1 - S	i 6	8	8	ð 18		8	1					
		2	-	5.31	5003-555-8813-YPROT	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7	1000	0	13.54	6.77		1	<u>i</u>		- 84	3			2	3 1 1	
FEEDER 8822	275KV =C05-Q10 FEEDER 8822 (BELMONT) X, Y PROTECTION	+4A8	2005	4.00	5003-555-8822-BAYCONT 5003-555-8822-PSPITY	REMOTE TERMINAL UNIT FOXBORD C3D DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	FOXBORD DEWAR	DM1200 DIGITAL	Yes	10			-	8 8	13.53	6.77	2	-	3	4.00	4.00	> 2041	2026/27 (6)	> 2041	> 2041
1.309/40003401	AND CONTROL CUBICLE				20182022(1997-2000))		1000000	1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	3.355-1	620					-0.0000001	0.0000		_							
					5003-555-8822-PSSITA	RFL 9743 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9743 DIGITAL	Yes	0		1			13.53	6.77			j.						
					5003-555-8822-PS5/TB	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10					13.53	6.77									
					5003-555-8822-XPROT	CURR DIFF RELAY MICOM P344 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9	13.53	3 6.77			8	1	9		1	j.					
					5003-555-8822-YPROT	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7			13.53	6.77											
DIAMETER 04 -	275KV =C04-Q20 FEEDER 8824 (MOLENDINAR) X V PROTECTION	+4A7	2006	4.00	5003-555-8824-BAYCONT 5003-555-8824-P55(TA1	REMOTE TERMINAL UNIT FOXBORD C50 DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	FOXBORD	C50 DM1200 DIS(TA)	Yes	15		3	4 - 8	8 8	13.54	6.77	2 8	- 2	3	4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER ODER	AND CONTROL CUBICLE						0.000	Dimited District	1.14		<u> </u>					0.04		_							
					5003-555-8824-P55ITA2	RFL 9743 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0					13.27	6.64									
					5003-555-8824-P55/TB1	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10		<u>)</u> i			13.27	6.64			3	i i					
					5003-555-8824-PSSITB2	RFL 9745 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0					13.27	6.64									
					5003-555-8824-XPROT	RELAY CB MGMT GE C60 (VER 2.93 FIRMWARE)	GE	C60 (VER 2.93)	Yes	9	13.54	4 6.77		<u>6</u> 8	1	13	<u> </u>		3	-					
					5003-555-8824-XPROT	RELAY DIFF GE L90 2T H00 NEU-SXX-UET-W7R	GE	L90 2T : HOD NEU UET	No	7	13.98	6.99													
					5003-555-8824-YPROT	CURR DIFF RELAY MICOM P344 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9			13.54	6.77		1	2	_	- 2	-					
DIAMETER 05 -	275KV =C05-Q20 FEEDER 8825	+4A10	2006	4.00	5003-555-8825-BAYCONT	REMOTE TERMINAL UNIT FOXBORD C50	FOXBORD	C50	Yes	13			13.4	9.77	13.53	6.77				4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER 8825	(MOLENDINAR) X, Y PROTECTION	N			5003-555-8825-PSSITA1	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10	ji 2	8		S é	13.53	6.77	5 0		3				650		
	AND CONTROL CUBICLE				5003-555-8825-PSSITA2	RFL 9745 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0	12 - 1		2 2	2 3	13.53	6.77	16	- 8 C	- 2	-					
						12	(a)	20	e	3		8		2 2			15 I I		15						
					5003-555-8825-PSSITB1	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Ves	10	2				13.53	6.77									
					5003-555-8825-PSSITB2	RFL 9745 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0	1	8		5 5	13.53	6.77	× •		8						
					5003-555-8825-XPROT	RELAY CB MGMT GE C60 /VER 2 93 FIRMWARE)	GE	CE0 (VER 2.93)	Yes		13 53	3 6.77		8 8	8	2		- 0		-					
					5003-555-8825-XPROT	RELAY DIFF GE L90 2T H00 N6U-SXX-U6T-W7R	GE	L90 2T : HOO NEU UET	No	7	13.98	6.99		<u>8</u> 8	1	1			3						
					5003-555-8825-YPROT	CURR DIFF RELAY ALSTOM P544 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9			12.40	6.20											
DIALISTED 42.	275/0/	12.64	2007	2.74	5003-555-8825-YPROT	COMMS INTERFACE UNIT ALSTOM P391	AREVA	P591 (50VDC)	Yes	90			13.53	6.77	12.17	6.00	2		24	2.71	3.74	> 2042	2022/22 (6)	> 2042	- 2012
FEEDER 8848	(MIDDLE RIDGE) X, Y	TDAL	2007	3.71	5003-555-8848-PSBLKA	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10		8 8	1	s a	12.17	6.09	-	- 1 I	8	3.72	3.71	2042	2027/25 [0]	2042	3 2042
1.1800.edf3355600	PROTECTION AND CONTROL								100001 100000		10-1	0	8	s - 9				- e	0	1			1		1
	COBICLE				5003-555-8848-F58LKB	DEWAR DM1200 PROTSIG DIG 90-320V SOPPLY	DEWAR	DM1200 DISITAL	ves	10					12.17	6.09			18						
					5003-555-8848-P55ITA	DEWAR DM1200 PROT SIG DIG 90-320V SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10	2	1	Ê		11.57	5.78									1
					5003-555-8848-PSSITB	RFL 9743 PROT SIG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0		1		8 0	11.82	5.91	8 - E		ð.						1
1					5003-555-8848-XPROT	CURR DIFF RELAY MICOM P344 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9	12 17	7 6.09		8 1	8								1	1	1
1					5003-555-8848-XPROT	COMMS INTERFACE UNIT ALSTOM P391	AREVA	P591 (50VDC)	Yes	90	12.17	7 6.09		1		1	P +		- 2	-			1	1	1
1					5003-555-8848-YPROT	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7	1		12.17	6.09		1			- 21					1	1
Objecti	l ive ID: A	4474	80	33	322 Version	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	sel-421 (1A) (5U) e Date: 27/02	Ves 2/20	7			12.17	6.09							1				1

Objective ID:

504



	APPENDIX A - S003 GREENBANK 275KV SUBSTATION AND SVC SECONDARY SYSTEMS - EQUIPMENT HEALTH INDICES AND RECOMMENDED REPLACEMENT TIMEFRAME																								
Notes:	 (a): Subject to Powerlink's 0&M (b): Recommended Timeframe is (c): Based on Visual Inspection and (d): As a minimum requirement, 	Safety Requ based on m nd Subject to Rubber Seal	irements, C hajority of E o the decisi Is, Air fiter	Current Equipme on of th and Ter	Standard Solutions and Implem ent Health Indices he Control Building and Second rminals and Links are required t	rentation Methodologies, it may be more beneficial to slig ary Systems Panels. A number of New Cables may be requ to be repaiced by the recommended timeframe. New Mai	n with the recommunication of constants of the second second second second second second second second second s	ended replacement timefra ontrol building or secondar uld be considered if Exsiting	me of sedondary / systems panels ; Cables are to be	is change reaplac	equipmer ed. ed.	nt		-								RECOMM Trigger Co Solut	ENDED REPLAC anditions only, tions, implemen	EMENT TIMMIN Exclude conside Itation methodo	IG (Based on erations for ologics)
BAY	C&P PANI	a	1			SECONDARY SYSTEMS EQUIPMENT					X-PRO	т	Y-PROT	T	AUX & CT	TRL	REVENUE	OPS	WAN	CABLES(HI)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chessis)	Sec Sys Eqiupment	CADIES	YARD MARSHALLIN G KIOSKS
Function	Panel Description	Panel No.	Year Hi	1	Functional Loc.	Description	Manufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	Eff Age	HI Eff	ff. Age	HI E	ff. Age	HI I	Eff. Age HI	Eff. Age	н	C&P Panels to HV Yard Marshalling Kiosks (C8, MK, CT, VT, AC, DC, CDOLING)	Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Parels to HV Yard Marshalling Kiosks (CB, MK, CT, VT, AC, DC, COOLING)	Yard Marshalling Kiosks (CB, MK, CT. VT, AC, DC, COOLING)
DIAMETER 14 -	275KV =C14-Q10 FEEDER 8849	+644	2007 3.7	71 5003	3-555-8849-84YCONT	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	050	Yes	15				1	12.17	6.09		3		3.71	371	> 2042	2027/28 (b)	> 2042	> 2042
FEEDER 8849	(MIDDLE RIDGE) X, Y	Control de Control		5003	3-SSS-8849-PSPITY	DEWAR DM1200 PROTSIG DIG 90-3207 SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10		į.		1	12.17	6.09		1		x1002255	2009/02/27	10100010000	10000		- 101.490.00
	CUBICLE			5003	3-555-8849-P55ITA	DEWAR DM1200 PROT SIG DIG 90-3207 SUPPLY	DEWAR	DM1200 DIGITAL	Yes	10					11.57	5,78									
				5003	3-SSS-8849-PSSITB	RFL 9745 PROT 5IG DIG I/O 48-125V	RFL ELECTRONICS	9745 DIGITAL	Yes	0			1	1	11.93 5	5.96									
				5003	3-555-8849-XPROT	CURR DIFF RELAY MICOM P544 + 2ND PORT	MICOM	P544 (+ 2nd Port)	Yes	9	12.17	6.09	8	-	-	3		12	1						
				5003	3-555-8849-XPROT	COMMS INTERFACE UNIT ALSTOM P591	AREVA	P591 (50VDC)	Yes	90	12.17 (6.09		1	_		8 8 1 9	_	12 -						
				5003	3-SSS-8849-YPROT	RELAY DISTANCE SCHW/ZER 421-5 1A 24 LED	SCHWEITZER	SEL-421-5 (1A) (5U)	Yes	6		5	9.00	4.50											
DIAMETER 12 -	275KV =C12-Q10 FEEDER 8887	+5A13	2006 4.0	00 5003	3-SSS-8887-BAYCONT	REMOTE TERMINAL UNIT FOXBORO CS0	FOXBORO	050	Yes	15			- 0	3	1354 (6.77		<u> </u>		4.00	4.00	> 2041	2026/27 (b)	> 2041	> 2041
FEEDER 8887	(BLACKSTONE) X, Y PROTECTION			5003	3-SSS-8887-XPROT	CURR DIFF RELAY ALSTOM P544 + 2ND PORT	ALSTOM	P544 (+ 2nd Port)	Yes	9	13.47 6	6.73	- 8	196	-	-		-							
	AND CONTROL CODICLE			5003	3-555-6887-YPROT	RELAY DISTANCE SEL-421 (1A) (5U)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7	13.34 0	1	13.54	6.77	-	-			1						
DIAMETER 11 -	275KV =C11-Q10 FEEDER SISS	+5010	2006 4.0	00 5003	3-SSS-8222-BAYCONT	REMOTE TERMINAL UNIT FOXEORO CS0	FOXBORO	C50	Vec	15		1	8	1	13.53	6.77		045	8	4.00	4.00	> 2041	2026/27 (b)	> 2011	> 2041
FEEDER 8888	(BLACKSTONE) X, Y PROTECTION	(30)2/04/1	1,200,000,000,000	5003	3-SSS-8888-XPROT	RELAY CURR DIFF DISTANCE MICOM P546	SCHNEIDER	P546	Yes	14	9.61	4.80		-						n negotinezh		5.798896.065	10000-0000003560	10023079276	0.000.000000
LOCAL WYES	AND CONTROL CUBICLE	+105	2007 3 7	5003	3-SSS-8888-YPROT	RELAY DISTANCE SEL-421 (1A) (SU)	SCHWEITZER	SEL-421 (1A) (5U)	Yes	7		1	13.53	6.77	6.02	5.81		-	-	3.71	3.71	> 2042	2027/28/64	> 2012	> 20/2
TERM BLDG 1	1) LAN EXTENSION CUBICLE	714.5	2007 3.1	5003	3-SSS-NBAY-LCF1	MONITOR TFT	HEWLETT	L1740	Yes	1	. 3	2			0.78	0.65			1	2.72	5.71	2042	2027/28 (0)	9 2042	9 2042
				5003	3-SSS-NBAY-OWNTWK1	SWITCH E/NET 32PRT RUGGED RSG2300 OPSWAN	RUGGEDCOM	RSG2300 (32PT) 48VDC	No	3			- 2	1				4.32	3.60						
			3	5003	3-SSS-NBAY-OWPRINT1	PRINTER	HEWLETT PACKARD	HP5100TN	Yes	0	a - 10		-	-				0.78	0.65	2 1/2 - 1-1-1					_
COMMS BLDG +2	TELECOMMUNICATIONS	+2A1	2008 3.4	43 5003	3-SSS-NBAY-OWINVRT2	INVERTER 125VDC/240VAC 1600W	LATRONICS	UTRO 100	No	3	5 32		- 8	12	-			13.54	6.77	3.43	3.43	> 2043	2028/29 (b)	> 2043	> 2043
OPSWAN	CUBICLE			5003	3-SSS-NBAY-OWNTWK2				No	2		6		200		53		8.53	7.11						
				5003	3-SSS-NBAY-OWSERV2	SERVER	ICP ELECTRONICS	3GHZ P4	Yes	15								12.00	10.00						
BLDG +4	CONTROL BUILDING +4	+4B1	2006 4.0	00 5003	3-SSS-NBAY-LCF4	MONITOR	HEWLETT	HP 1702	Yes	0			-	1	12.00 1	0.00				4.00	4	> 2041	2026/27 (b)	> 2041	> 2041
OPSWAN	CUBICLE			5003	3-SSS-NBAV-ICEA	LOCAL CONTROL FACILITY PC X TERMINAL	WYSE	V90LXP+1GB/512MB	Yes	0	<u> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</u>		- 8	-	11 28	9.40		-	-						
				5003	3-SSS-NBAY-OWCAM1	CANON ETHERNET CAMERA	CANON	VB-C10iR	Yes	0	0 - 68	· 8,	. 3	30				12.00	10.00	5					
				5003	3-SSS-NBAY-OWCAM4	AXIS ETHERNET CAMERA ASSEMBLY	Take a Look	P5532E	No	0		_		-		_		8.03	6.69)					
				5003	3-SSS-NBAY-OWINVRT4 B-SSS-NBAY-OWNTWK4	INVERTER 125VDC/240VAC 1600W	LATRONICS	UTRO 100	No	3	-	- 8	- 8		-	-		13.54	6.77						
				5003	3-SSS-NBAY-OWNTW#4				Yes	0		_	_	- 20	-	-		12.00	10.00	d.					
											1. 16			i.											
		_		5003	3-SSS-NBAY-RTUCOM4	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	0				1	13.54 (6.77		1		÷					
BIDG +51CE	CONTROL BUILDING +5 NSCILCE	+581	2006 4.0	5003	3-SSS-NBAY-TMING4	GPS CLOCK - TEKRON TCG01	TEKRON	TCG01	Yes	0		_		-	13.54 (6.77		1		3 73	4	> 2041	2026/27/64	> 2011	> 20/1
COMMON	AND COMMON RTU AND			5003	3-SSS-NBAY-LCF5	LOCAL CONTROL FACILITY SUN ULTRA 25	SUN	SUN ULTRA 25	Yes	8			- 8	1	7.45	6.21				5.75					10.000
OPSWAN	OPSWAN CUBICLE			5003	3-SSS-NBAY-LCFINTS	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	050	Yes	0				1	13.54 (6.77		3		š.					
				5003	3-SSS-NBAY-NSCLNK15	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	050	Yes	0	8 8	_		1	13.54 (6.77		-		4					
				5003	3-SSS-NBAY-OW/NTWK5	SERVER SERIAL PORT	PERLE	04012086	Yes	0						0.77		12.00	10.00	2					
1				5003	3-SSS-NBAY-RTUCOM5	REMOTE TERMINAL UNIT FOXBORO C50	FOXBORO	C50	Yes	0	-			1	13.54	6.77									
1				5003	3-SSS-NBAY-TIMINGS	GPS CLOCK - TEKRON TCG01	TEKRON	TCG01	Yes	0	5 33	1	. 8	1	13.54 (6.77		2	1						
1				5003	3-SSS-NBAY-TIMINGS	CLOCK GPS TEKRON TCS01-E SDMV8	TEKRON Take a Loch	TCG01-E SDMV8	Ves	1	S - 540				8.28	4.14		6 54	1 50	2					
				5003	3-SSS-NBAY-OWINVRTS	INVERTER 125VDC/240VAC 1600W	LATRONICS	UTRO 100	No	3		-	- 1	-	-	-	-	13.54	6.77	Ś.					
				5003	3-SSS-NBAY-OWNTWK5				Yes	0	8 - B.S	ē.	5	2432	3			12.00	10.00						
				1.	10000000000000000000000000000000000000				1000	1000				1.0					100000000						

1.0



		APP	END	XA	- 50	03 GREENBANK 2	75KV SUBSTATION AND SVC	SECONDA	RY SYSTEMS	- EQUIPI	MEN	T HE	ALT	HIN	DIC	ES AI	ND	RECOM	MEND	DED F	REPLACEN	MENT TIM	EFRAM	E		
Image: biologic		 (a): Subject to Fowerlink's D&M 3 (b): Recommended Timeframe is (c): Based on Visual Inspection an (d): As a minimum requirement, 1 	Safety Requ based on r nd Subject t Rubber Sea	uiremen majority to the de als, Air fi	of Equip ecision of ilter and	ent Standard Solutions and Implem pment Health Indices of the Control Building and Second I Terminals and Links are required	entation Methodologies, it may be more beneficial to align ary Systems Panels. A number of New Cables may be requr to be repailed by the recommended timeframe. New Mars	with the recomment ied if location of cont halling Klosks, should	ded replacement timefram trol building or secondary : d be considered if Exsiting (e of sedondary sy systems panels is o Cables are to be re	stems ex changed capiaced	quipment											RECOMIN Trigger C Solu	tended REPLAC Conditions only, tions, implement	EMENT TIMMIN Exclude consid	IG (Based on erations for ologies)
Audie Fuel bencham	BAY	C&P PAN	ÆL				SECONDARY SYSTEMS EQUIPMENT			-		X-PR	TOT	Y-PR	от	AUX &	CTRL	REVENUE	OPS	WAN	CABLES (HI)	YARD MARSHALLING KIOSKS (HI)	C&P PANELS (Chassis)	Sec Sys Eqlupment	CABLES	YARD MARSHALLIN G KIOSKS
Rish e convert	inction	Panel Description	Panel No.	, Year	н	Functional Loc.	Description	Manufacturer	Model number	Obsolescence (Yes / No)	Spare Qty	Eff. Age	н	Eff. Age	н	Eff. Aga	н	Eff. Age H	I Eff. Ag	e HI	C&P Panels to HV Yard Manshalling Klosks (CB, MK, CT, VT, AC, DC, COOUNG)	Yard Marshalling Klosks (CB, MK, CT, VT, AC, DC, CDOLING)	C&P Panels	Sec Sys Equipment & Auxiliary Components	C&P Panels to HV Yard Marshalling Kiosiss (CB, MK, CT, VT, AC, DC, COOLING)	Yard Marshalling Klosks (CB, MK, CT, VT, AC, DC, CDOLING)
Image: constrained by the second of	ion c an c	CONTROL BUILDING +6 COMMON RTU AND OPSWAN CUBICLE	+681	2007	3.71	1 5003-555-NBAY-LCF6 5003-555-NBAY-LCF6 5003-555-NBAY-OWCAM3 5003-555-NBAY-OWNTWK6 5003-555-NBAY-OWNTWK6	LOCAL CONTROL FACULTY PC X TERMINAL MONITOR IFF CANON ETHERNET CAMERA	WYSE HEWLETT PACKARD CANON	V90LXPe 168/512M8 L1740 VB-CS0R	Yes Yes Yes Yes	0 1 0 7 7					6.98 0.78	5.81 0.65		12.00 12.00	10.00	3.19	3.71	>2042	2027/28 (b)	>2042	>2042
RDA +HAM Mod WRD MUNDANDE RU 42.4 200 3.4.40000000000000000000000000000000000						5003-SSS-NBAY-OWNTWK6 5003-SSS-NBAY-OWNTWK6 5003-SSS-NBAY-OWNTWK6 5003-SSS-NBAY-OWNTWK6 5003-SSS-NBAY-OWNVR16 5003-SSS-NBAY-OWNVR16	SERVER PORT 45/UC2 PERLE 04030450 - OPSWAN SERVER PORT 45/UC2 PERLE 04030450 - OPSWAN INVERTER 125/UC2/240/AC 1800W ESMOTT TERMINAL UNIT FOXBORD C50 CONDECT TERMINAL UNIT FOXBORD C50	PERLE PERLE LATRONICS FOXBORO	IOLAN STS16DC IOLAN STS16DC IRM1812DC CS0	No No No Yes	2 2 6 3 0					12.17	6,09		12.00 12.00 13.54	10.00 10.00 10.00 6.77						
INDEX-STORM HILD HELD CONTINUENT RD PC-14 208 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.02 3.14 2.014 2.01 0.01	H4 HSM	HIGH SPEED MONITORING BLD +4 DATA ACQUISITION UNIT	+4C14	2009	3.14	4 S003-SSS-NBAY-PSPM 5003-SSS-NBAY-PSPM	LOCAL STORAGE UNIT HATHAWAY LSU 125VDC RECORDER HATHAWAY IDM HSM 16CH 2A	HATHAWAY	LSU IDM T3 HSM 16CH	Yes	0					10.43	5.22		F	+	2.79	3.14	> 2044	2029/30 (b)	> 2044	>2044
BLOG - HOM HOM HYELD MARCHONN NR 0 4C34 200 3.14 3.05 3.14 3.20	S HSM	HIGH SPEED MONITORING BLD +5 DATA ACQUISITION UNIT	+5C14	2009	3.14	4 SOO3-SSS-NBAY-PSPM	RECORDER HATHAWAY IDM HSM 16CH 2A	HATHAWAY	IDM T3 HSM 16CH	Yes	0					10.43	5.22				2.79	3.14	> 2044	2029/30 (b)	> 2044	> 2044
BULDING 4-125V OC K BATTLEY 200 3.00 BULDING 4-125V OC K BATTLEY DEDI VELA (MODEL SOLO) I.E. I.E. <td>HSM HSM</td> <td>HIGH SPEED MONITORING BLD +6 DATA ACQUISITION UNIT</td> <td>+6C14</td> <td>2009</td> <td>3.14</td> <td>4 SOO3-SSS-NBAY-PSPM</td> <td>RECORDER HATHAWAY IDM HSM 16CH 2A</td> <td>HATHAWAY</td> <td>IDM T3 HSM 16CH</td> <td>Yes</td> <td>٥</td> <td></td> <td></td> <td></td> <td></td> <td>10.43</td> <td>5.22</td> <td></td> <td></td> <td></td> <td>2.79</td> <td>3.14</td> <td>>2044</td> <td>2029/30 (b)</td> <td>>2044</td> <td>> 2044</td>	HSM HSM	HIGH SPEED MONITORING BLD +6 DATA ACQUISITION UNIT	+6C14	2009	3.14	4 SOO3-SSS-NBAY-PSPM	RECORDER HATHAWAY IDM HSM 16CH 2A	HATHAWAY	IDM T3 HSM 16CH	Yes	٥					10.43	5.22				2.79	3.14	>2044	2029/30 (b)	>2044	> 2044
BURDING 4125YD CK MATTLEY Dois Dial Dial <thd< td=""><td></td><td>BUILDING +4 125V DCX BATTERY</td><td></td><td>2006</td><td>10.00</td><td></td><td>BUILDING +4 125V DC X BATTERY</td><td>EXIDE</td><td>VRLA (MODEL 90A09)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>a</td><td></td><td>2020 / ASAP</td><td></td><td></td></thd<>		BUILDING +4 125V DCX BATTERY		2006	10.00		BUILDING +4 125V DC X BATTERY	EXIDE	VRLA (MODEL 90A09)													a		2020 / ASAP		
AUXILIAR UNICIDING 4125V OCY MATTERY COM BULDING 4125V OCY MATTERY COM BULDING 4125V OCY MATTERY <t< td=""><td>G +4 DC</td><td>BUILDING +4 125V DC X BATTERY MONITOR AND CHARGER</td><td></td><td>2006</td><td>7.00</td><td></td><td>BUILDING +4 125V DC X BATTERY MONITOR AND CHARGER</td><td>RECTIFIER TECHNOLOGIES</td><td>RT48-110V/12A</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2027/28</td><td></td><td></td></t<>	G +4 DC	BUILDING +4 125V DC X BATTERY MONITOR AND CHARGER		2006	7.00		BUILDING +4 125V DC X BATTERY MONITOR AND CHARGER	RECTIFIER TECHNOLOGIES	RT48-110V/12A															2027/28		
BULDER of 129V CC VBATTERY 000 7.0 BULDER of 129V CC VBATTERY 000000000000000000000000000000000000	XILIARY B	BUILDING +4 125V DC Y BATTERY		2006	10.00		BUILDING +4 125V DC Y BATTERY	EXIDE	VRLA (MODEL 90A09)															2020 / ASAP		
Distribution ROARD C <thc< th=""> C <thc< th=""></thc<></thc<>	8	BUILDING +4 125V DC Y BATTERY MONITOR AND CHARGER BUILDING +4 125V DC		2006	7.00	-	BUILDING +4 125V DC Y BATTERY MONITOR AND CHARGER BUILDING +4 125V DC DISTRIBUTION BOARD	RECTIFIER TECHNOLOGIES	RT48-110V/12A	-				_			_		-	-	-			2027 / 28		
NUMBRE -5125V DCX MATTERY 200 200 DUILDING -5125V DCX MATTERY 2000 2000 DUILDING -5125V DCY MATTERY 2000		DISTRIBUTION BOARD BUILDING +5 125V DC X BATTERY	-	2006	10.00	2 2 (BUILDING +5 125V DC X BATTERY	EXIDE	VRLA (MODEL 90409)	-	-			-			-		+	+	-			2020 / ASAP		<u> </u>
LUDIO 4 5 DC AUXILINARY BUILDING -5 125V DCY BATTERY 200 10.0 BUILDING -5 125V DCY BATTERY 200 20.0 BUILDING -5 125V DCY BATTERY 200 20.0 <th< td=""><td>0</td><td>BUILDING +5 125V DC X BATTERY MONITOR AND CHARGER</td><td></td><td>2006</td><td>7.00</td><td></td><td>BUILDING +5 125V DC X BATTERY MONITOR AND CHARGER</td><td>RECTIFIER TECHNOLOGIES</td><td>RT4B-110V/12A</td><td>-</td><td>2 - 7</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td>\vdash</td><td></td><td></td><td></td><td>-</td><td>2027 / 28</td><td></td><td></td></th<>	0	BUILDING +5 125V DC X BATTERY MONITOR AND CHARGER		2006	7.00		BUILDING +5 125V DC X BATTERY MONITOR AND CHARGER	RECTIFIER TECHNOLOGIES	RT4B-110V/12A	-	2 - 7	-							\vdash				-	2027 / 28		
SUPPY MONITIONAND CHARGER 2006 2.00 BUILDING +5 125V DC Y BATTERY MONITOR AND CHARGER RECEIPER TECHNOLOGIES RE40-110/12A Image: Comparison of the comparison	IXILIARY B	BUILDING +5 125V DC Y BATTERY		2006	10.00		BUILDING +5 125V DC Y BATTERY	EXIDE	VRLA (MODEL 90A09)															2020 / ASAP		
Inclusion of LSP UP Conduction Cond Cond Streturition BOARD Cond Cond <t< td=""><td>B</td><td>BUILDING +5 125V DC Y BATTERY MONITOR AND CHARGER</td><td></td><td>2006</td><td>7.00</td><td></td><td>BUILDING +5 125V DC Y BATTERY MONITOR AND CHARGER</td><td>RECTIFIER TECHNOLOGIES</td><td>RT48-110V/12A</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2027 / 28</td><td></td><td></td></t<>	B	BUILDING +5 125V DC Y BATTERY MONITOR AND CHARGER		2006	7.00		BUILDING +5 125V DC Y BATTERY MONITOR AND CHARGER	RECTIFIER TECHNOLOGIES	RT48-110V/12A															2027 / 28		
BUILDING 46 125V DCX BATTERY 2007 10.0 BUILDING 46 125V DCX BATTERY 2008 VELA (MODEL 100A07) C C <thc< th=""> <thc< th=""></thc<></thc<>	0	DISTRIBUTION BOARD		2006	7.00		BUILDING +5 125V DC DISTRIBUTION BOARD	-																2027 / 28		
BUILDING 45 LSV DC VBATTERY 2007 6.50 DOLDING 45 LSV DC VBATTERY MINICSU-2 125.0 V MINICSU-2 125.0 V Cold Addition Cold Addition <thcold addition<="" th=""> Cold Addition</thcold>		BUILDING +5 125V DC X BATTERY		2007	10.00		BUILDING +6 125V DC X BATTERY	EXIDE	VRLA (MODEL 100A07)				_									-		2020 / ASAP	_	
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Planning Statement		09/04/2020
Title	CP.0xxxx – S003 Greenbank 275 Systems Replacement – Planning	kV SVC and Secondary Statement ¹
Zone	Moreton	
Need Driver	Emerging compliance risks arising obsolescence of Greenbank's age secondary systems.	J from condition and ing SVC and 275kV
Network Limitation	Greenbank Substation and SVC is Queensland's N-1-50MW/600MW maintain South West to South Eas transfer capability.	s needed to meet Powerlink h reliability obligations and st Queensland power
Pre-requisites	None	

Executive Summary

Ageing and obsolete secondary systems at Greenbank Substation, including the SVC, 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's forecasts confirm there is an enduring need to maintain electricity supply into the Moreton South area. The removal or reconfiguration of the Greenbank 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 South West and South East Queensland.

The preferred network solution for Powerlink to continue to meet its statutory obligations is the replacement of the at-risk secondary systems by 2028/29.

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)).

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2. Introduction

The Greenbank Substation (S003) is a major switching substation in South East Queensland located approximately 42km South East of Brisbane CBD.

It was established in 2006 to augment the network to meet reliability obligations. The substation is an integral part of the Southern Queensland transmission network. It connects major 275kV transmission lines from South West Queensland and is also a major switching station for other 275kV transmission lines supplying the Gold Coast and South Moreton areas.

The 275kV SVC, adjacent to the substation, was commissioned in 2008 to provide fast reactive power support in the area. A Power Oscillation Damper (POD) is integrated into the voltage control function of the SVC to also provide a critical power system damping function.

Figure 1 shows the existing 275 and 110 kV transmission networks in the area but omits the 33kV and lower voltage distribution networks, as well as the Energex owned 110kV networks.



Figure 1: Moreton South 275kV and 110kV network



Figure 2 shows the existing connection configuration of the Greenbank Substation.

Figure 2: Greenbank surrounding transmission network

A condition assessment of the 275 secondary systems and 275kV SVC has determined they are approaching the end of their technical life, with many components becoming obsolete, i.e. no longer supported by the manufacturer and limited spares available. As secondary systems age they become more susceptible to failure along with the increased time to rectify faults due to the obsolescence of the equipment, significantly affects the availability and reliability of these systems and their ability to continue to meet the requirements of the National Electricity Rules (the Rules). The condition assessment recommends that they be replaced by the end of 2028/29.

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

In addition to the site-specific impacts of obsolescence at Greenbank Substation, it is also important to note the compounding impact of equipment obsolescence occurring across the fleet of secondary systems assets installed in the Powerlink network. Running multiple secondary systems to failure across the network increases the likelihood of concurrent systemic faults with significant implications for network reliability and safety.

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 Greenbank Substation.

3. Greenbank Demand Forecast

The Greenbank Substation functions as a bulk supply switching station to the South East of Greater Brisbane and Gold Coast for Energy Queensland's network. The Gold Coast, Loganlea, Belmont and Murarrie substations draw power from the Greenbank Substation. It is a critical alternative path that supplies power to the Trade Coast which are mostly industrial as well as supplying the Brisbane CBD east ring.

Figure 3 shows the 10% PoE and 50% PoE maximum consolidated demand forecast in the Greenbank area derived from both Energy Queensland's and Powerlink's forecasting models. The maximum demand in the area is forecast by approximately 12% over the 10-year period.

In addition, the Greenbank Substation is a critical node to maintain supply and reliability in the Brisbane region and surrounding suburbs.

S003 Greenbank 275kV SVC and Secondary Systems Replacement - Planning Statement



Figure 3 – Greenbank forecast delivered maximum demand

Figure 4 shows historical load duration curves for the Greenbank Substation. The load duration curve demonstrates the quantity of power (MW) that flows through Greenbank Substation into main injection points in the surrounding area.



Figure 4 - Load duration curves for Greenbank Substation

4. Statement of Investment Need

As shown in Figure 5 the Greenbank Substation connects:

- 1. 11 x 275kV feeders,
- 2. 275kV SVC, and
- 3. 5 x 275kV capacitor banks.

Six 275kV feeders can be categorised as primarily connections to bulk supply substations (Loganlea, Belmont, Molendinar and Mudgeeraba). Three other 275kV connections provide connectivity between Blackstone/Swanbank E substations and Greenbank. The remaining 275kV feeders (from Mudgeeraba) are part of the SWQ to SEQ grid section.

Therefore, notwithstanding issues with distribution of power flows, there are not enough 275kV feeders delivering power to Greenbank to connect to feeders delivering power to bulk supply points. In addition, only the feeder from Swanbank E is connected to the same diameter as a load feeder (Greenbank – Mudgeeraba). As a result, to effectively by-pass the substation significant rearrangement of the feeders would be required in addition to establishing a tee connection to one load feeder. This would neither be economic or technically feasible from a network capability perspective.

Therefore, to maintain the functionality of the substation the 275kV bus must be maintained. This is also required to connect the SVC and other reactive power plant. The SVC, as well as providing dynamic voltage control, also provides critical damping for the oscillatory stability of the power system. This damping function is provided through a power oscillation damper (POD) input to the SVC voltage control loop. The POD uses frequency perturbations (at the power system oscillatory frequencies) to modulate the voltage to drive a load response that help damp the target oscillation. To do this the SVC must be connected to all of the feeders (via a 275kV bus). This allows the modulation of voltage to impact the largest load base possible to dive an improvement in damping.

The Greenbank Substation connects five 275kV capacitor banks. These capacitor banks are required to support high South East Queensland loads and power transfers into South East Queensland. As shown in Figure 3 load connected to the Greenbank Substation is forecast to grow over the outlook period. This is consistent with the future outlook for South East Queensland as shown in Table 2.22 of the 2020 Transmission Annual Planning Report (TAPR).

Power transfer limits into South East Queensland are limited by voltage stability. The 275kV network between SWQ and SEQ and between CQ and SQ operate well above the surge impedance loading and as such demand considerable reactive power from SEQ to supply the reactive power losses. In addition, in order for the power system to land in a *satisfactory state*, following a contingency, several capacitor banks are required to switch into service. AEMO is then required to resecure the power system in anticipation of the next contingency. This would require further reactive power to be scheduled.

As a result, it is not unexpected that all capacitor banks are not required to be in-service during system normal conditions. However, these capacitor banks, including those connected to the Greenbank Substation, are required to maintain the system in a secure state.



Figure 5: Greenbank Substation 275kV electrical layout

Therefore, as outlined in Section 2, the Greenbank Substation is a major transmission node between in South East Queensland. Removing the functionality of the substation would have a major impact on the performance of the SWQ-SEQ grid section as well as impacting the reliability of supply to the loads to the Moreton South and Gold Coast areas.

The secondary systems are required to operate Greenbank Substation. Therefore, the secondary systems at Greenbank 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 South West Queensland – South East Queensland grid section.

5. Network Risk

Table 1 summarises the load and energy at risk.

N-1 Contingency	N-1-1 contingency	Max Load at Risk (MW)	Max Energy at Risk (MWh)	Ave. Energy at Risk (MWh)	Load Transfer (MW)
Middle Ridge-Greenbank	Middle Ridge-Greenbank	0	0	0	0
Blackstone -Greenbank	Blackstone-Greenbank	0	0	0	0
Belmont -Greenbank	Loganlea-Greenbank	97	161	1	36
Loganlea -Greenbank	Belmont-Greenbank	97	161	1	0
Molendinar -Greenbank	Molendinar -Greenbank	296	1827	106	
Molendinar -Greenbank	Molendinar -Greenbank	296	1827	106	0
Molendinar -Greenbank	Mudgeeraba T5	145	554	118	0
Mudgeeraba -Greenbank	Mudgeeraba -Greenbank	84	354	7.4	0
Swanbank E PS- Greenbank	Swanbank E PS- Blackstone	361	7566	2515	0

 Table 1: Greenbank Load at Risk (24hr)

6. Non Network Options

Greenbank Substation provides flexibility to transmission network in the south east area of the Greater Brisbane also, provides alternative critical path to the Brisbane CBD east ring and the Brisbane Trade Coast.

To fully meet the Greenbank demand, the non-network solution must be capable of delivering up to 2300MW of power. Potential non-network solutions may also be able to provide supply to individual 275kV connections, (as per the load at risk table), to reduce the scope of this project (noting that this may have an adverse impact on the damping provided by the SVC that in itself may need to be addressed).

Powerlink is not aware of any Demand Side Solutions (DSM) in the Moreton South and Gold Coast areas supplied from Greenbank 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.

7. Network Options

7.1 **Proposed Option to address the identified need**

Planning recommends the replacement of all 275 secondary systems at Greenbank Substation by 2027. This option ensures that all reliability of supply and asset condition criteria is met as well as maintaining the power transfer capability between South West Queensland to South East Queensland.

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

7.2 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.

7.2.1 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 System Standards of the National Electricity Rules and its Transmission Authority.

8. **Recommendations**

Powerlink has reviewed the condition of the secondary systems at Greenbank Substation and anticipates they will reach end of technical service life by 2027. It is therefore recommended that the systems be replaced by 2028/29.

Retaining Greenbank Substation will allow Powerlink to continue to meet its required reliability obligations (N-1-50MW/600MWh), maintain power transfer capability between south west and south east Queensland and maintain damping for critical power system modes of oscillation.

Powerlink is currently unaware of any feasible alternative options to minimise or eliminate the load at risk at Greenbank 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.

9. References

- 1. S003 Greenbank 275kV SVC and 275kV Substation Secondary Systems Condition Assessment Report Feb 2020 - Version 1.0
- 2. Transmission Annual Planning Report 2020
- 3. Asset Planning Criteria Framework

Base Case Risk and Maintenance Costs Summary Report

Greenbank Secondary Systems Replacement

Version Number	Objective ID	Date	Description
1.0	A4418208	05/11/2020	Original document.

1 Purpose

The purpose of this model is to quantify the base case risk cost profiles for the secondary systems at Greenbank substation which are proposed for reinvestment by the end of the 2029 financial year.

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 Greenbank 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 Queensland area;
- VCRs 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; and
- Greenbank substation is one of the major 275kV substation hubs supplying the greater Brisbane and Gold Coast area comprising of residential, commercial and industrial loads. Accordingly the Queensland regional VCR value of \$40,030 has been used when evaluating network risk cost.

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 Greenbank, 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 Greenbank 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).Financial risks to respond on- site and replace failed secondary systems in an emergency manner ¹ .	N/A						

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.

3.3 Base Case Risk Cost

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



Figure 1 – Greenbank secondary systems total risk cost



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

² The significant increase in modified risk cost in 2027 coincides with the depletion of available spares.



Figure 3 – Greenbank secondary systems risk cost by category



Figure 4 – Greenbank 2029 risk cost by category

3.4 Base case risk statement

The main base case risks for the secondary systems at Greenbank 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 Maintenance costs

Maintenance costs are still being developed. For the purposes of this report, maintenance has been modelled as 1.5% of the project capital. This is consistent with historical averages of maintenance costs as a percentage of capital investment. The total base case risk and maintenance cost is show below:



Figure 5 - Base Case Total (Risk Cost + Maintenance)

5 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 22%. Hence, an increase in VCR of 100% would increase the overall risk cost by around 22%.

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 model is most sensitive to emergency replacement cost followed by plant restoration time for both pre-secondary systems obsolescence and post-secondary systems obsolescence states.

	Item	Value	Unit	
	VCR	40,030	\$/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	
Financial	Emergency replacement cost with no spares	0.1	\$million	





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



Figure 7 - Participation factors, secondary systems model – post secondary systems obsolescence



Project Scope Report

Network Portfolio

Project Scope Report

CP.0xxxx

Greenbank Secondary Systems Replacement

Concept – Version 1

Document Control

Change Record

Issue Date	Responsible Person	Objective Document Name	Background
01/05/20		Project Scope Report CP.0xxxx Greenbank Secondary Systems Replacement	Preliminary scope

Related Documents

Issue Date	Responsible Person	Objective Document Name
27/02/2020		S003 Greenbank Secondary Systems Condition Assessment Report - 26 February 2020(A3322504)

Project Contacts

Project Sponsor		
Strategist – HV/Digital Asset Strategies		
Team Leader Grid Planning		
Manager Projects	TBD	Ext.
Project Manager	TBD	Ext.
Design Coordinator	TBD	Ext.

Project Details

1. Project Need & Objective

S003 275kV Greenbank Substation and Greenbank SVC is a major switching substation in South East Queensland. It was established in 2006 to accommodate network augmentation / expansion at the time. This substation is an integral part of the Queensland transmission backbone. Greenbank substation is located approximately 42 km South West of Brisbane CBD. The 275kV SVC, is adjacent to the substation, was commissioned in 2008 to provide fast reactive power support in the area.

A condition assessment was conducted in February 2020.. The assessment concluded that the majority of secondary systems for 275kV network will reach the end of technical asset live between 2026 and 2029 and recommended that secondary systems replacement at this site should be completed by 2028.

The objective of this project is to maintain the network reliability and availability within Powerlink's current standards and practices, and to minimise operational and compliance risks associated with aging and obsolete secondary systems assets. The replacement of the secondary systems at S003 is to be completed by 31 December 2028.

2. Project Drawing



Figure 1 – Greenbank Single Line Diagram



Figure 2 – 275kV Greenbank Substation Aerial View

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, this project option consists of a single stage replacement of the 275kV Secondary System panels in building +4 & +6 at S003 Greenbank. The replacement will utilise the spare space within each building to accomplish the replacement. Panels within building +5 will need to be installed into a new control building.

3.1.1. Transmission Line Works

Not Applicable

3.1.2. S003 Substation Works

In Building +4 replacement of all secondary system panels: -

- C05-Q20 FEEDER 8825 (MOLENDINAR) X, Y PROTECTION AND CONTROL CUBICLE
- C06-Q10 FEEDER 805 (SWANBANK E) X, Y PROTECTION AND CONTROL CUBICLE
- C06-Q30 COUPLER (CB 5062) X, Y PROTECTION AND CONTROL CUBICLE
- C06-Q20 FEEDER 835 (MUDGEERABA) X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q10 FEEDER 8813 (LOGANLEA) X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q20 FEEDER 8824 (MOLENDINAR) X, Y PROTECTION AND CONTROL CUBICLE
- C05-Q10 FEEDER 8822 (BELMONT) X, Y PROTECTION AND CONTROL CUBICLE
- C05-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- CONTROL BUILDING +4 COMMON RTU AND OPSWAN CUBICLE
- HIGH SPEED MONITORING BLD +4 DATA ACQUISITION UNIT

In Building +6 replacement of all secondary system panels: -

- C13-Q10 FEEDER 8848 (MIDDLE RIDGE) X, Y PROTECTION AND CONTROL CUBICLE
- C13-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q10 FEEDER 8849 (MIDDLE RIDGE) X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q20 SVC (CB 58112) X, Y PROTECTION AND CONTROL CUBICLE
- C15-Q10 CAP 5 X, Y PROTECTION AND CONTROL CUBICLE
- C15-Q20 CAP 6 X, Y PROTECTION AND CONTROL CUBICLE
- C16-Q20 CAP 8 X, Y PROTECTION AND CONTROL CUBICLE
- CONTROL BUILDING +6 COMMON RTU AND OPSWAN CUBICLE

For Building +5: -

- Design, procure, construct and commission a new 275kV control building for a staged cutover of secondary systems panels from the existing +5 building to the new building.
- Design, procure, construct and commission a new cable termination rack such that cables terminated directly between the existing secondary systems panels and marshalling kiosks can be relocated from the existing control buildings to new cable termination rack without need to re-run cables to the yard marshalling kiosks.

- Design, procure, construct and commission cable trenches to the new cable termination rack and run cables from the new cable termination rack to the new control building as appropriate;
- Replacement of the following secondary systems panels to the current standard: into the new control build: -
 - C11-Q10 FEEDER 8888 (BLACKSTONE) X, Y PROTECTION AND CONTROL CUBICLE
 - C11-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - C12-Q10 FEEDER 8887 (BLACKSTONE) X, Y PROTECTION AND CONTROL CUBICLE
 - C12-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - 275KV 1 BUS BUS ZONE AND CB FAIL BUS TRIP X AND Y PROTECTION CUBICLE
 - 275KV 2 BUS BUS ZONE AND CB FAIL BUS TRIP X AND Y PROTECTION CUBICLE
 - C10-Q10 FEEDER 1 (SPARE) X, Y PROTECTION AND CONTROL CUBICLE
 - o C10-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - C10-Q20 FEEDER 836 (MUDGEERABA) X, Y PROTECTION AND CONTROL CUBICLE
 - $\circ~~$ 275KV 1 BUS BUS ZONE AND CB FAIL BUS TRIP X , Y PROTECTION AND CONTROL CUBICLE
 - 275KV 2 BUS BUS ZONE AND CB FAIL BUS TRIP X , Y PROTECTION AND CONTROL CUBICLE
 - o C08-Q10 (CB 5832) CAP 3 X, Y PROTECTION AND CONTROL CUBICLE
 - C08-Q20 CAP 4 X, Y PROTECTION AND CONTROL CUBICLE
 - CONTROL BUILDING +5 NSC/LCF AND COMMON RTU AND OPSWAN CUBICLE
 - HIGH SPEED MONITORING BLD +5 DATA ACQUISITION UNIT

In Building +1&2 replacement of all secondary system panels: -

- AMENITIES BUILDING (BUILDING1) LAN EXTENSION CUBICLE
- TELECOMMUNICATIONS BUILDING +2 MASTER OPSWAN CUBICLE

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

3.1.3. Remote End Substation Works

Modify remote end protection, control, automation and communications systems as required at Molendinar, Swanbank E, Mudgeeraba, Loganlea, Belmont, Blackstone and Middle Ridge.

3.1.4. Telecoms Works

Adjust telecoms for new protection/control equipment as required.

3.1.5. Easement/Land Acquisition & Permits Works

Not applicable

3.2. Key Scope Assumptions

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

- The replacement of panels will utilise the spare space within each building to accomplish the desired outcome.
- Spare panel space exists in the +4, +5 & +6 control buildings. Details of substation buildings panel space are shown in the Table below:

Greenbank Substation				
Building Description	Designation	Functional Use	Panels to be replaced	Spare Sec Sys Panel Spaces
Amenities Building	+1	Amenities	N/A	N/A
Communications	+2	Comms equipment	N/A	N/A
Work shed	+3	Maintenance Workshop	N/A	N/A
Substation Secondary System Building +4	+4	Sec Sys Bays =C04, =C05, =C06	11	12
Substation Secondary System Building +5	+5	Sec Sys Bays =C08, =C09, =C10, =C11, =C12	15	9
Substation Secondary System Building +6	+6	Sec Sys Bays =C13, =C14, =C15, =C16	9	13

- The replacement of any new control building should be done in a manner that minimizes the required cable runs.
- The location of the new cable termination rack should be such that cables terminated directly between secondary systems panels and the marshalling kiosks can be relocated from the existing control building to the new cable termination rack without need to re-run cables to the yard marshalling kiosks.
- Existing control cables are assumed to have sufficient remaining life so as not to require replacement.
- The 275kV SVC secondary systems are excluded from this project as they will be treated under a separate project.

4. Project Timing

4.1. Project Approval Date

The anticipated date by which the project will be approved is June 2025.

4.2. Site Access Date

Site access is available immediately for Powerlink construction works to commence.

4.3. Commissioning Date

The latest date for the commissioning of the new assets included in this scope the decommissioning and removal of redundant assets, where applicable, is 31 December 2028.

5. Special Considerations

The following issues are important to consider during the implementation of this project:

- any existing assets to be removed and disposed of as part of this scope must be identified within the estimate together with the forecast asset residual value at time of disposal;
- plant and equipment identified as suitable to be recovered for use as spares or returned to stores should be packaged and transported to an appropriate storage location, with a suitable allowance for the cost included in the estimate;
- as some of the outages may be difficult to get, the estimate should include some discussion on the delivery method to achieve a successful cutover of the secondary systems; and
- a high level project implementation plan including staging and outage plans should be considered as part of the estimate.

6. Asset Management Requirements

Equipment shall be in accordance with Powerlink equipment strategies.

Unless otherwise advised **Construction** will be the Project Sponsor for this project. The Project Sponsor must be included in any discussions with any other areas of Strategy and Business Development.

will provide the primary customer interface with Energex. 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.

The asset boundary with Energex will be the LV terminals of the 132/66kV transformer.

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. Division of Responsibilities

Not Applicable.

10. Related Projects

Project No.	Project Description	Planned Comm Date	Comment		
Pre-requisit	Pre-requisite Projects				
	Greenbank SVC				
Co-requisite	e Projects				
Other Relat	ed Projects				



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Authored by	Project Manager	
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1. Executive Summary

S003 275kV Greenbank Substation and Greenbank SVC is a major switching substation in South East Queensland. It was established in 2006 to accommodate network augmentation / expansion at the time. This substation is an integral part of the Queensland transmission backbone.

A condition assessment was conducted in February 2020 which recommended replacement timing for secondary systems assets and equipment based on their health indices and condition assessment data. The assessment concluded that the majority of secondary systems for 275kV network will reach the end of technical asset live between 2026 and 2029 and recommended that secondary systems replacement at this site should be completed by 2029.

The project option consists of a multi-stage replacement of the 275kV Secondary System panels in building +4 & +6 at S003 Greenbank. The replacement will utilise the spare space within each building to accomplish the replacement. Panels within building +5 will need to be installed into a new control building.

1.1 Project Estimate

Estimate Components		Base \$	Escalated \$
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		29,604,197	39,441,175
Mitigated Risk			
Contingency Allowance			
TOTAL			

1.2 Project Financial Year Cash Flows

	June 2020 Base \$	Escalated \$
To June 2026	4,090,211	5,449,319
To June 2027	6,776,305	9,027,957
To June 2028	7,491,769	9,981,158
To June 2029	6,564,696	8,746,034
To June 2030	4,681,216	6,236,707
TOTAL	29,604,197	39,441,175

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Concept Estimate for CP.0xxxx – Greenbank Secondary Systems Replacement

2. Project and Site Specific Information

2.1 Project Dependencies & Interactions

The latest date for the commissioning of the new assets included in this scope the decommissioning and removal of redundant assets, where applicable, is December 2028.

This project will have some level of interaction with the following projects tabulated below, however at time of preparing this estimate, none of these projects are approved. Actual impacts from these related project will be determined upon the execution stage of this project.

Project No.	Project Description	Planned Commissioning Date	Comment
Dependencies			
	Greenbank SVC Secondary Systems Replacement	June 2026	May be approved prior to this project.
Interactions			
	Greenbank to Molendinar Polymer insulator replacements	June 2028	Outage interactions Not Approved project
	Greenbank - Mudgeeraba 275k∀ TL Refit	June 2028	Outage interactions Not Approved project
Other Related I	Projects		
	Polymer Insulator Replacements Greenbank	June 2030	Not Approved project

2.2 Site Specific Issues

Greenbank substation is located approximately 42 km South West of Brisbane CBD. The 275kV SVC, that is adjacent to the substation, was commissioned in 2008 to provide fast reactive power support in the area.

The 275kV SVC secondary systems works are excluded from this project as they will be treated under a separate project.

3. Replacement in the existing building (in-situ equipment replacement)

3.1.1 Scope

Briefly, this project option consists of a multi-stage replacement of the 275kV Secondary System panels in building +4 & +6 at S003 Greenbank. The replacement will utilise the spare space within each building to accomplish the replacement. Panels within building +5 will need to be installed into a new control building.

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Figure 1 Operational Diagram for S003

3.1.1.1 Substations Works

In Building +4 replacement of all secondary system panels:

- C05-Q20 feeder 8825 (Molendinar) X, Y protection and control cubicle
- C06-Q10 FEEDER 805 (SWANBANK E) X, Y PROTECTION AND CONTROL CUBICLE
- C06-Q30 COUPLER (CB 5062) X, Y PROTECTION AND CONTROL CUBICLE
- C06-Q20 FEEDER 835 (MUDGEERABA) X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q10 FEEDER 8813 (LOGANLEA) X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C04-Q20 FEEDER 8824 (MOLENDINAR) X, Y PROTECTION AND CONTROL CUBICLE
- C05-Q10 FEEDER 8822 (BELMONT) X, Y PROTECTION AND CONTROL CUBICLE
- C05-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- CONTROL BUILDING +4 COMMON RTU AND OPSWAN CUBICLE
- HIGH SPEED MONITORING BLD +4 DATA ACQUISITION UNIT

In Building +6 replacement of all secondary system panels:

- C13-Q10 FEEDER 8848 (MIDDLE RIDGE) X, Y PROTECTION AND CONTROL CUBICLE
- C13-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q10 FEEDER 8849 (MIDDLE RIDGE) X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
- C14-Q20 SVC (CB 58112) X, Y PROTECTION AND CONTROL CUBICLE
- C15-Q10 CAP 5 X, Y PROTECTION AND CONTROL CUBICLE
- C15-Q20 CAP 6 X, Y PROTECTION AND CONTROL CUBICLE

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- C16-Q20 CAP 8 X, Y PROTECTION AND CONTROL CUBICLE
- CONTROL BUILDING +6 COMMON RTU AND OPSWAN CUBICLE

For Building +5:

- Design, procure, construct and commission a new 275kV control building for a staged cutover of secondary systems panels from the existing +5 building to the new building.
- Design, procure, construct and commission a new cable termination rack such that cables terminated directly between the existing secondary systems panels and marshalling kiosks can be relocated from the existing control buildings to new cable termination rack without need to re-run cables to the yard marshalling kiosks.
- Design, procure, construct and commission cable trenches to the new cable termination rack and run cables from the new cable termination rack to the new control building as appropriate;
- Replacement of the following secondary systems panels to the current standard: into the new control build: -
 - C11-Q10 FEEDER 8888 (BLACKSTONE) X, Y PROTECTION AND CONTROL CUBICLE
 - C11-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - C12-Q10 FEEDER 8887 (BLACKSTONE) X, Y PROTECTION AND CONTROL CUBICLE
 - C12-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - o 275KV 1 BUS BUS ZONE AND CB FAIL BUS TRIP X AND Y PROTECTION CUBICLE
 - 0 275KV 2 BUS BUS ZONE AND CB FAIL BUS TRIP X AND Y PROTECTION CUBICLE
 - C10-Q10 FEEDER 1 (SPARE) X, Y PROTECTION AND CONTROL CUBICLE
 - C10-Q30 COUPLER X, Y PROTECTION AND CONTROL CUBICLE
 - C10-Q20 FEEDER 836 (MUDGEERABA) X, Y PROTECTION AND CONTROL CUBICLE
 - \circ $\,$ 275KV 1 BUS BUS ZONE AND CB FAIL BUS TRIP X , Y PROTECTION AND CONTROL CUBICLE
 - \circ $\,$ 275KV 2 BUS BUS ZONE AND CB FAIL BUS TRIP X , Y PROTECTION AND CONTROL CUBICLE
 - C08-Q10 (CB 5832) CAP 3 X, Y PROTECTION AND CONTROL CUBICLE
 - C08-Q20 CAP 4 X, Y PROTECTION AND CONTROL CUBICLE
 - CONTROL BUILDING +5 NSC/LCF AND COMMON RTU AND OPSWAN CUBICLE
 - HIGH SPEED MONITORING BLD +5 DATA ACQUISITION UNIT

In Building +1&2 replacement of all secondary system panels:

- AMENITIES BUILDING (BUILDING1) LAN EXTENSION CUBICLE
- TELECOMMUNICATIONS BUILDING +2 MASTER OPSWAN CUBICLE
 - +2 MASTER OPSWAN CUBICLE

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

3.1.1.2 Transmission Line Works

Not applicable.

3.1.1.3 Telecommunication Works

Adjust telecoms for new protection/control equipment as required

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3.1.1.4 Remote End Substation Works

Modify remote end protection, control, automation and communications systems as required at Molendinar, Swanbank E, Mudgeeraba, Loganlea, Belmont, Blackstone and Middle Ridge.

3.1.1.5 Easement/Land Acquisition & Permit Works

Not applicable

3.1.2 Major Scope Assumptions

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

- The replacement of panels will utilise the spare space within each building
- Sufficient spare panel space exists in the +4 & +6 control buildings.
- There is adequate space available for the installation of the new control building.
- The existing bay cables from primary plants will be sufficient for the new IEDs and the latest design standard, thus no new cable are required to run between primary plant to the MKs/Control Building
- Existing ground condition is suitable for the construction of control building foundations;
- An 8hr Return to service time has been assumed for 275kV feeder Bays.
- It is assumed that 275kV cap bank bays can remain out of service without the need of a return to service plan during the period its bay's been worked on as per staging plan.
- The location of the new cable termination rack should be such that cables terminated directly between secondary systems panels and the marshalling kiosks can be relocated from the existing control building to the new cable termination rack without need to re-run cables to the yard marshalling kiosks.
- Existing control cables are assumed to have sufficient remaining life so as not to require replacement;
- Existing bay marshalling kiosks will have all the CT terminal replaced and bring up to the latest design standard at time of the construction.
- No extension or modification to the security fence will be required;
- Internal design, contractor design and MSP resources are available as required;
- A geotechnical study has not been performed and estimates are based on previous findings in the area;

3.1.3 Scope Exclusions

- The 275kV SVC secondary systems are excluded from this project as they will be treated under a separate project
- Dealing with unidentified asbestos;
- Any extension of the existing platform, fence earth grid and roads is excluded. Rock is excluded from the base estimate;
- This estimate does not include any costs for repairing or modification to the primary plants;
- The estimate excludes upgrades for the following: earth grid, internal roads, lights, fences and gates.

3.2 **Project Execution**

3.2.1 Project Schedule

The duration of the project is 66 months. It is based on a start date of 02 June 2026 and final project commissioning date December 2029.

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Task	Target Completion	
Project Approval, PAN Issued	June 2024	
DC Contract Award	Nov 2024	
Design Ready for Panel Fabrication	August 2025	
Procurement (building and panels)	Aug 2025 - April 2026	
Construction and FAT	April 2026 - Oct 2026	
Commissioning and stage cut over	Oct 2026 - Dec 2029	
Project completion	December 2029	

3.2.2 Network Impacts

The delivery of this project will require multiple outages to cutover each of the 275kV bays. The network will not only impact the main site S003 Greenbank but also the remote ends at Belmont, Blackstone, Mudgeeraba, Loganlea, Molendinar and Swanbank with the respective connected feeders

Further to this the following Network Impacts have also been identified:

- The 275kV cap bank bays can remain out of service for the short durations (as staged)
- 1 week Outages with a 8 hour return to service is expected to be available for the 275kV feeder bays. (details in outage restriction table below):

3.2.3 Project Staging

The project staging plan below details a sequential list of tasks with minor paralleled activities.

Stage		Description/Tasks	
1	275kV 1Bus BZ & CB-Fail & Bus VTs		
2	275kV 2Bus BZ & CB-Fail & Bus VTs		
3	CAP 3 Sec Sys refurb		
4	CAP 4 Sec Sys refurt		
5	Feeder bay 836 (MUI	DGEERABA) Sec Sys refurb	
6	Feeder bay 836 cut-o	ver with line isolator/Earth Switch, line VT &	remote-end mods
7	Bus Coupler CB5010	2 Sec Sys refurb.	
8	Feeder bay 1 (SPARE	E) Sec Sys refurb	
9	Feeder bay 836 reconnected to Bus Coupler.		
10	Feeder bay 8888 (BLACKSTONE) Sec Sys refurb		
11	Feeder bay 8888 cut-over with line isolator/Earth Switch, line VT & remote-end mods		
12	Bus Coupler CB50112 Sec Sys refurb.		
13	Feeder bay 8888 reconnected to Bus Coupler.		
14	Feeder bay 8887 (BLACKSTONE) Sec Sys refurb		
15	Feeder bay 8887 cut-over with line isolator/Earth Switch, line VT & remote-end mods		
16	Bus Coupler CB50122 Sec Sys refurb.		
17	Feeder bay 8887 reconnected to Bus Coupler.		
18	Control bldg. +5 Decommission Pending on time of year/outage constraints can be used as a fill in stage		
19	Feeder bay 8824 (MOLENDINAR) Sec Sys refurb		
20	Feeder bay 8824 cut-over with line isolator/Earth Switch, line VT & remote-end mods		
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21	Bus Coupler CB5042 Sec Sys refurb.
22	Feeder bay 8813 (LOGANLEA) Sec Sys refurb
23	Feeder bay 8824 reconnected to Bus Coupler.
24	Feeder bay 8825(MOLENDINAR) Sec Sys refurb
25	Feeder bay 8825 cut-over with line isolator/Earth Switch, line VT & remote-end mods
26	Bus Coupler CB5052 Sec Sys refurb.
27	Feeder bay 8822 (BELMONT) Sec Sys refurb
28	Feeder bay 8825 reconnected to Bus Coupler.
29	Feeder bay 835 (MUDGEERABA) Sec Sys refurb
30	Feeder bay 835 cut-over with line isolator/Earth Switch, line VT & remote-end mods
31	Bus Coupler CB5062 Sec Sys refurb.
32	Feeder bay 805 (SWANBANK E) Sec Sys refurb
33	Feeder bay 835 reconnected to Bus Coupler.
34	Feeder bay 8848 (MIDDLE RIDGE) Sec Sys refurb
35	Feeder bay 8848 cut-over with line isolator/Earth Switch, line VT & remote-end mods
36	Bus Coupler CB50132 Sec Sys refurb.
37	Feeder bay 8848 reconnected to Bus Coupler.
38	SVC bay (CB 58112) Sec Sys refurb
39	SVC bay (CB 58112) cut-over with line isolator/Earth Switch, line VT & remote-end mods
40	Bus Coupler CB50142 Sec Sys refurb.
41	Feeder bay 8849 (MIDDLE RIDGE) Sec Sys refurb
42	Feeder bay 8849 reconnected to Bus Coupler.
43	CAP 5 Sec Sys refurb
44	CAP 6 Sec Sys refurb
45	CAP 8 Sec Sys refurb

3.2.4 Resourcing

The delivery of this project is based on utilising a combination of the following resources Powerlink Design, Powerlink MSP and Contractor.

<u>Design</u>

All detailed design will be completed internally for Primary, Civil/Structural, Telecommunications, Automation and Protection

Substation Construction

Construction work will be mostly conducted by the Contractor for all Civil works and Electrical Cable installations. All work that integrates with operational equipment will be performed by the Powerlink MSP.

Test and Commissioning

All testing and commissioning for the cut over of secondary systems will be performed by Powerlink MSP.

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3.3 Project Estimate

Estimate Components		Base \$	Escalated \$
Estimate Class	5		
Estimate Accuracy	+100% / -50%		
Base Estimate		29,604,197	39,441,175
Mitigated Risk			
Contingency Allowance			
TOTAL			

3.4 Project Financial Year Cash Flows

	June 2020 Base \$	Escalated \$
To June 2026	4,090,211	5,449,319
To June 2027	6,776,305	9,027,957
To June 2028	7,491,769	9,981,158
To June 2029	6,564,696	8,746,034
To June 2030	4,681,216	6,236,707
TOTAL	29,604,197	39,441,175

3.5 Project Asset Classification

Asset Class	Asset Life	Base \$	Percentage
Secondary systems	15 years	24,777,170	84%
Communications	15 years	1,076,392	4%
Primary plant	40 years	3,750,634	13%
Transmission lines	50 years		
TOTAL		29,604,197	

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4. References

Document name	Version	Date
Project Scope Report	1.0	01/05/2020

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