APD ENGINEERING

BROOKLYN TERMINAL STATION

TRANSMISSION REVENUE RESET (TRR) PROJECT SCOPING

REVISION HISTORY

REV	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY	DATE
A	First issue	[C-I-C]	[C-I-C]	[C-I-C]	10/12/2019
B	Second issue	[C-I-C]	[C-I-C]	[C-I-C]	06/03/2020

PREPARED FOR

[C-I-C]

T: [C-I-C]
E: [C-I-C]
A: L31, 2 Southbank Boulevard, Southbank, VIC, 3006

RESPOND TO

[C-I-C]

M: [C-I-C]
E: [C-I-C]
A: [C-I-C]

GENERAL ADMINISTRATION

P: 1300 273 797
E: admin@APDeng.com.au

TABLE OF CONTENTS

EXECUTIVE SUMMARY

AusNet Services engaged APD Engineering to prepare project scopes and estimates relating to options for replacement of poor condition primary equipment at Brooklyn Terminal Station (BLTS) for inclusion in AusNet Services' 2022 – 2027 Transmission Revenue Reset.

APD Engineering has reviewed a functional scope prepared by AusNet Services and developed detailed scopes and estimates for each planning option required by AusNet Services.

The planning options considered, along with the associated costs, are included in Table 1 below. These costs exclude contingency but include an allowance for overheads and finance charges. The cost estimates have an accuracy of ±30% and are based on the limitations outlined in Section 2 of this report.

Option	Option Title	Capital Cost (M)
1	Integrated project (22kV outdoor switchgear)	$14.60
2	66kV Switchgear	$12.58
3a	22kV switchgear – indoor	$4.63
3b	22kV switchgear – outdoor	$2.34

[C-I-C]

DESIGN MANAGER

1. INTRODUCTION

AusNet Services engaged APD Engineering to prepare project scopes and estimates relating to options for replacement of poor condition primary equipment at Brooklyn Terminal Station (BLTS) for inclusion in AusNet Services' 2022 – 2027 Transmission Revenue Reset.

The 66kV and 22kV primary and secondary equipment, along with planning options for consideration have been prepared as per reference [1] – Brooklyn Terminal Station (BLTS) Circuit Breaker Replacement Project TD-0007753 are considered in this report.

2. LIMITATIONS

In preparing this report, APD Engineering has relied on information provided by AusNet Services, including (but not limited to):

1. Site drawings and documentation outlining the existing equipment on site;

2. Condition assessments and functional scopes identifying poor condition primary and secondary assets for replacement prepared by AusNet Services, along with supporting information to allow the development of the scopes and estimates;

3. A top down estimating spreadsheet provided by AusNet Services to calculate the capital costs associated with each project;

4. Unit costs for major items of plant and equipment, labour costs and other costs assumptions provided by AusNet Services as part of the top down estimating spreadsheet.

3. ASSUMPTIONS

1. The replacement of 66kV CB primary equipment requires replacement of associated secondary equipment and includes the remote ends for both distance and line differential scheme protections.

2. No allowance has been made for telecommunications replacement.

3. It is assumed that, where required, the existing 415 VAC and 250VDC equipment can be modified as part of the project. Replacement of the full 415V AC/ 250VDC or 48VDC distribution boards and batteries has not been considered.

4. It is assumed that SCIMS hardware can be modified as part of the project. Only modification to existing SCIMS equipment has been included in the estimates. Full

replacement of the RTU/SCIMS alarm modification or panel replacement has not been considered.

5. Allowance has been made to replace all Condition 4 and Condition 5 relays, including relays older than 9 years under Condition 2 and 3.

4. OPTION 1 – INTEGRATED PROJECT

4.1. OUTLINE OF PROJECT

This planning option delivers a single integrated project undertaking all works identified as required for the replacement of poor condition assets at Brooklyn Terminal Station.

4.2. 220KV WORKS

AusNet Services has identified that there are a number of 220kV instrumentation transformers that have been identified as in poor condition and require replacement.

Based on the information provided to APD Engineering, APD Engineering expects that in-situ replacement (with associated outages) will be viable for each of these replacements.

4.3. 66KV WORKS

AusNet Services has identified that there are nineteen poor condition 66kV circuit breakers at Brooklyn Terminal Station requiring replacement. Of these circuit breakers, one will be replaced by another project and three are out of service and will not be replaced. In addition, there are a number of isolators, instrumentation transformers and earth switches that have been identified as in poor condition and require replacement.

Based on the information provided to APD Engineering, APD Engineering expects that in-situ replacement (with associated outages) will be viable for each of these replacements.

4.4. 22KV WORKS

AusNet Services has identified that there is one poor condition 22kV circuit breaker at Brooklyn Terminal Station requiring replacement. In addition, there are 22kV isolators and earth switches that are in poor condition and require replacement.

As outlined in Section 6, AusNet Services has identified that either outdoor or indoor equipment may be used at BLTS and requested that the lowest capital cost option be included in the integrated project costs. It should be noted that, as outlined in Section 6.2, the overall life-cycle costs will be different to the upfront capital cost.

Based on the information provided to APD Engineering, it is expected that in-situ replacement (with associated outages) will be viable for each of these replacements.

4.5. PLANNING ESTIMATE

The cost to implement the above project scope of work as an integrated project in Appendix A has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of $14.60M (±30%).

These costs exclude contingency but include an allowance for overheads and finance charges.

5. OPTION 2 – 220KV AND 66KV SWITCHGEAR REPLACEMENT

5.1. OUTLINE OF PROJECT

This planning option delivers a project undertaking all identified works required for the replacement of 220kV instrumentation transformers and 66kV poor condition assets at Brooklyn Terminal Station.

5.2. 220KV WORKS

The works required under this option includes the replacement of in-service instrumentation transformers identified by AusNet Services as being in poor condition.

5.3. 66KV WORKS

The works required under this option excludes any out of service equipment or equipment to be replaced by other projects. The works under this option includes the replacement of in-service 66kV circuit breakers, isolators, instrumentation transformers and earth switches identified by AusNet Services as being in poor condition.

The cost to replace selected poor condition 220kV and 66kV primary & secondary equipment has been based on the scope in Appendix A.1 and has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of $12.58M (±30%). These costs exclude contingency but include an allowance for overheads and finance charges.

6. OPTION 3 – 22KV SWITCHGEAR REPLACEMENT

6.1. OUTLINE OF PROJECT

This planning option delivers a project undertaking all works required for the replacement of 22kV poor condition assets at Brooklyn Terminal Station.

6.2. INDOOR SWITCHBOARD

AusNet Services identified that the replacement of 22kV assets with an indoor switchboard may be an option for this site, and requested the inclusion of an estimate for the costs of this work

The works required under this sub-option includes the installation of a new switch room at BLTS and the replacement of all 22kV circuit breakers, isolators, instrumentation transformers and earth switches with an indoor switchboard.

It is recognised that the installation of a new indoor 22kV switchboard would result in the replacement of significantly more equipment than the outdoor switchgear sub-option. It is noted that while the upfront capital cost of this option is higher than the costs associated with outdoor switchgear, there may be benefits that are not be included in the current capital estimation. These benefits may include changes in maintenance regime –due to a change from outdoor to indoor equipment and a change from old equipment to new equipment, reduction of footprint and renewal of additional equipment not at end of life.

The cost to this option has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of $4.63M (±30%). These costs exclude contingency but include an allowance for overheads and finance charges.

6.3. OUTDOOR SWITCHGEAR

The works required under this sub-option includes the replacement of all 22kV circuit breakers, isolators, instrumentation transformers and earth switches identified by AusNet Services as being in poor condition with outdoor modern equivalents.

The cost to replace selected poor condition 22kV primary & secondary equipment has been based on the scope in Appendix A.2 and has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of $2.34M (±30%). These costs exclude contingency but include an allowance for overheads and finance charges.

7. REFERENCES

The following document were applied in preparation of this report.

TYPE	OWNER	TITLE
Document	AusNet	Brooklyn Terminal Station (BLTS) – Circuit Breaker Replacement Project TD-0007753

Document	AusNet	Top-down Transmission Estimate for Option Selection Rev 2.7
Document	AusNet	Relays Condition Score Status as of 07.05.2019
Drawing	AusNet	Brooklyn Terminal Station 22kV, 66kV and 220kV Single Line Diagram – T14/31/53/1

APPENDIX A.

66kV and 22kV switchyard replacement primary and secondary works within BLTS includes the following primary and secondary assets replacement.

APPENDIX A.1.

The scope to replace selected 220kV and 66kV switchgear

220kV Bay	Activity	Description (Primary Equipment)
No 4 Cap Bank	Remove	Existing No 4 Cap Bank CT "R" PHASE Existing No 4 Cap Bank CT "W" PHASE Existing No 4 Cap Bank CT "B" PHASE
	Install	Install 3 x single-phase Post Type 220kV CT
220kV Bay F	Remove	Existing FBTS 220KV L CB CT R/PH Existing FBTS 220KV L CB CT VCU
	Install	Install new FBTS 220KV L CB CT R/PH Install new FBTS 220KV L CB CT VCU
220kV Bay D	Remove	Existing ATS 220KV L 4 BUS CB CT VCU
	Install	Install new ATS 220KV L 4 BUS CB CT VCU
220kV Bay E	Remove	Existing KTS 220KV L 3 BUS CB CT VCU
	Install	Install new KTS 220KV L 3 BUS CB CT VCU
220kV Bay G	Remove	Existing NPSD L CB L CT VCU
	Install	Install new NPSD L CB L CT VCU

66kV Bay	Activity	Description (Primary Equipment)
66kV Bay B	Remove	Existing ATD 66kV Feeder CB Existing ATD 66kV Feeder CB Feeder Side Isolator Existing ATD 66kV Feeder CB Bus Side Isolator

	Install	ATD 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker ATD 66kV Feeder CB Feeder Side Isolator - Install on the feeder side of CB three 66kV disconnector ATD 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay H	Remove	Existing TYA 66kV Feeder CB
		Existing TYA 66kV Feeder CB Feeder Side Isolator
		Existing TYA 66kV Feeder CB Bus Side Isolator
	Install	TYA 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
		TYA 66kV Feeder CB Feeder Side Isolator - Install on the feeder side of CB three 66kV disconnector
		TYA 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay A	Remove	Existing TH No.2 66kV Feeder CB
		Existing TH No.2 66kV Feeder CB Feeder Side Isolator
		Existing TH No.2 66kV Feeder CB Bus Side Isolator
	Install	TH 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
		TH 66kV Feeder CB Feeder Side Isolator - Install on the feeder side of CB three 66kV disconnector
		TH 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay K	Remove	Existing FW No.1 66kV Feeder CB
		Existing FW No.1 66kV Feeder CB Feeder Side Isolator
		Existing FW No.1 66kV Feeder CB Bus Side Isolator
	Install	FW No.1 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
		FW No.1 66kV Feeder CB Feeder Side Isolator

		- Install on the feeder side of CB three 66kV disconnector
		FW No.1 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay J	Remove	Existing NT 66kV Feeder CB
		Existing NT 66kV Feeder CB Bus Side Isolator
	Install	NT 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
		NT 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay D	Remove	Existing LVN 66kV Feeder VT
		Existing LVN 66kV Feeder CB Feeder Side Isolator
		Existing LVN 66kV Feeder CB Bus Side Isolator
	Install	LVN 66kV Feeder VT - Install Single-Phase Post Type 66kV VT
		LVN 66kV Feeder CB Feeder Side Isolator - Install on the feeder side of CB three 66kV disconnector
		LVN 66kV Feeder Bus Isolator - Install on the bus side of CB three 66kV disconnector
66kV Bay T	Remove	Existing YVE 66kV Feeder CB
		Existing YVE 66kV Feeder CB CT "R" PHASE
		Existing YVE 66kV Feeder CB CT "W" PHASE
		Existing YVE 66kV Feeder CB CT "B" PHASE
	Install	YVE 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
66kV Bay N	Remove	Existing AL 66kV Feeder CB
		Existing AL 66kV Feeder CB CT "R" PHASE
		Existing AL 66kV Feeder CB CT "W" PHASE
		Existing AL 66kV Feeder CB CT "B" PHASE
	Install	AL 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker

66kV Bay S	Remove	Existing FW No.2 66kV Feeder CB
		Existing FW No.2 66kV Feeder CB CT "R" PHASE
		Existing FW No.2 66kV Feeder CB CT "W" PHASE
		Existing FW No.2 66kV Feeder CB CT "B" PHASE
	Install	FW No.2 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
66kV Bay G	Remove	Existing SCI 66kV Feeder CB
		Existing SCI 66kV Feeder VT "R" PHASE
		Existing SCI 66kV Feeder VT "W" PHASE
		Existing SCI 66kV Feeder VT "B" PHASE
	Install	SCI 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
		SCI 66kV Feeder VT - Install three- Single Phase Post Type 66kV VT
66kV Bay F	Remove	Existing TH No.1 66kV Feeder CB
	Install	TH No.1 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
66kV Bay C	Remove	Existing BMH 66kV Line CB
	Install	MBH 66kV Feeder Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
66kV Bay E	Remove	Existing 1-2 66kV Bus-Tie CB Existing 1-2 66kV Bus-Tie CB No.1 Bus Side Isolator Existing 1-2 66kV Bus-Tie CB No.2 Bus Side Isolator
	Install	1-2 66kV Bus-Tie Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker 1-2 66kV Bus-Tie No.1 Bus Side Isolator - Install on the No.1 bus side of CB three 66kV disconnector 1-2 66kV Bus-Tie No.2 Bus Side Isolator

		- Install on the No.2 bus side of CB three 66kV disconnector
66kV Bay L	Remove	Existing 2-3 66kV Bus-Tie CB Existing 2-3 66kV Bus-Tie CB No.2 Bus Side Isolator Existing 2-3 66kV Bus-Tie CB No.3 Bus Side Isolator
	Install	2-3 66kV Bus-Tie Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker 2-3 66kV Bus-Tie No.2 Bus Side Isolator - Install on the No.2 bus side of CB three 66kV disconnector 2-3 66kV Bus-Tie No.3 Bus Side Isolator - Install on the No.3 bus side of CB three 66kV disconnector
66kV Bay Q	Remove	Existing 3-4 66kV Bus-Tie CB Existing 3-4 66kV Bus-Tie CB No.3 Bus Side Isolator Existing 3-4 66kV Bus-Tie CB No.4 Bus Side Isolator Existing 3-4 66KV Bus-Tie CB CT "R" PHASE Existing 3-4 66KV Bus-Tie CB CT "W" PHASE Existing 3-4 66KV Bus-Tie CB CT "B" PHASE
	Install	3-4 66kV Bus-Tie Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker 3-4 66kV Bus-Tie No.3 Bus Side Isolator - Install on the No.3 bus side of CB three 66kV disconnector 3-4 66kV Bus-Tie No.4 Bus Side Isolator - Install on the No.4 bus side of CB three 66kV disconnector
66kV Bay Q	Remove	Existing 1-4 66kV Bus-Tie CB Existing 1-4 66kV Bus-Tie CB No.4 Bus Side Isolator Existing 1-4 Extension 66kV Bus-Tie CB No.1 Bus Extension Side Isolator
	Install	1-4 66kV Bus-Tie Circuit Breaker

		- Install one 66kV Dead Tank Circuit Breaker 1-4 66kV Bus-Tie No.4 Bus Side Isolator - Install on the No.4 bus side of CB three 66kV disconnector 1-4 66kV Bus-Tie No.4 Bus Side Isolator - Install on the No.4 bus side of CB three 66kV disconnector 1-1 Extension 66kV Bus-Tie Isolator - Install on the bus side of CB three 6kV disconnector
Bay C	Remove	Existing 1-1 Extension 66kV Bus-Tie Isolator
		Existing No.1 66kV Bus VT
		Existing No.1 66kV Bus VT Fused Isolator
		Existing No.1 66kV Bus VT Isolation Switch
	Install	1-1 Extension 66kV Bus Tie Isolator - Install on the bus side of CB three 66kV disconnector
		No.1 66kV Bus VT, Fused Isolator and Isolator Switch - Install three Single Phase Post Type 66kV VT
		- Install three Single Phase Fused Isolator
		- Install three Single Phase Isolator Switch
Bay H	Remove	Existing No.2 66kV Bus VT
		Existing No.2 66kV Bus VT Fused Isolator
		Existing No.2 66kV Bus VT Isolation Switch
	Install	No.2 66kV Bus VT, Fused Isolator and Isolator Switch - Install three Single Phase Post Type 66kV VT
		- Install three Single Phase Fused Isolator
		- Install three Single Phase Isolator Switch
Bay N	Remove	Existing No.3 66kV Bus VT Fused Isolator
	Install	No.3 66kV Bus VT Fused Isolator - Install three Single Phase Fused Isolator
Bay S	Remove	Existing No.4 66kV Bus VT "R" PHASE
		Existing No.4 66kV Bus VT "W" PHASE

		Existing No.4 66kV Bus VT "B" PHASE
		Existing No.4 66kV Bus VT Fused Isolator
		Existing No.4 66kV Bus VT Isolation Switch
	Install	No.4 66kV Bus VT, Fused Isolator and Isolator Switch - Install three Single Phase Post Type 66kV VT
		- Install three Single Phase Fused Isolator
		- Install three Single Phase Isolator Switch
Bay G	Remove	Existing B5 TRANS 66kV CB
	Install	B5 TRANS 66kV Circuit Breaker - Install one 66kV Dead Tank Circuit Breaker
Bay G	Remove	Existing No.5 220/66/6.6kV TRANS Group No.2 Bus 66kV Isolator
	Install	No.5 220/66/6.6kV TRANS Group No.2 Bus 66kV Isolator - Install on the No.2 bus side of No.5 220/66/6.6kV TRANS three 66kV disconnector
Bay M	Remove	Existing B3 220/66kV TRANS 66kV VT Fused Isolator
	Install	B3 220/66kV TRANS 66kV VT Fused Isolator - Install Single-Phase Fused Isolator
	Remove	Existing B4 220/66kV TRANS 220kV Neutral Isolator (Spare)
		Existing B4 220/66kV TRANS 66kV Neutral Isolator (Spare)
		Existing B4 220/66kV TRANS 66kV CB SYNC VT Fused Isolator
	Install	B4 220/66kV TRANS 66kV CB SYNC VT Fused Isolator - Install three- Single Phase Fused Isolator
		B4 220/66kV TRANS 220kV Neutral Isolator - Install B4 220/66kV TRANS 220kV Neutral Isolator
		B4 220/66kV TRANS 66kV Neutral Isolator - Install B4 220/66kV TRANS 66kV Neutral Isolator

The scope to replace selected poor condition secondary equipment associated with 66kV plant.

66kV Bay	Activity	Description (Secondary Equipment)
66kV Bay H	Remove	TYA X Distance Relay
		TYA X E/F P/W Relay
		TYA X Earth Fault Trip Timer Relay
		TYA BU Three Elements Instantaneous Overcurrent
		TYA Y Distance Relay
	Install	- Install new TYA Feeder X & Y Protection & Control Scheme
		- Install new TYA Feeder X & Y Protection & Control Scheme to remote end.
66kV Bay T	Remove	AL X Pilot Wire Trip Timer Relay AL X E/F P/W Relay AL X Pilot Wire Relay AL Y High Speed Biased Two Pilot Wire AL Y Pilot Wire Current Interlock Relay AL Y Sensitive Earth Leakage Relay AL BU Three Elements Instantaneous Overcurrent
	Install	- Install new AL Feeder X & Y Protection & Control Scheme
		- Install new AL Feeder X & Y Protection & Control Scheme to remote end.
66kV Bay G	Remove	SCI X Pilot Wire Relay
		SCI Y Protection
		SCI BU CB Fail Backup Timer Relay
		SCI BU Three Elements Instantaneous Overcurrent
	Install	- Install new SCI Feeder X & Y Protection & Control Scheme
		- Install new SCI Feeder X & Y Protection & Control Scheme to remote end.

66kV Bay C	Remove	BMH 66KV L Y Protection
	Install	- Install new BMH Feeder Y Protection & Control Scheme
		- Install new BMH Feeder Y Protection & Control Scheme to remote end.
66kV Bay E	Remove	# 1-2 66kV Bus-Tie BU Current CHECK Relay
	Install	- Install new No.1-2 66kV Bus-Tie CB Management Scheme
66kV Bay L	Remove	# 2-3 66kV Bus-Tie BU Current CHECK Relay
	Install	- Install new No.2-3 66kV Bus-Tie CB Management Scheme
66kV Bay Q	Remove	# 3-4 66kV Bus-Tie BU Current CHECK Relay
	Install	- Install new No.3-4 66kV Bus-Tie CB Management Scheme
66kV Bay Q	Remove	# 1-4 66kV Bus-Tie BU Current CHECK Relay
	Install	- Install new No.1-4 66kV Bus-Tie CB Management Scheme
Bay C	Remove	#1-4 & # 2-3 66 Bus-Tie CB Auto Control Relay
		66KV CB Auto Control Scheme
		66KV CB Auto Control Scheme
		66KV CB Auto Control Scheme
	Install	- Install new No. 1-4 & No. 2-3 66kV Bus-Tie CB Auto Control CB Management Scheme
66kV Bus Zone 1	Remove	#1 66 X Instantaneous Current Relay
		#1 66 Y Instantaneous Current Relay
	Install	- Install new No.1 66kV Bus X & Y Protection Scheme
66kV Bus Zone 2	Remove	#2 66 X Instantaneous Current Relay
		#2 66 Y Instantaneous Current Relay
	Install	- Install new No.2 66kV Bus X & Y Protection Scheme
66kV Bus Zone 3	Remove	#3 66 X Instantaneous Current Relay
		#3 66 Y Instantaneous Current Relay

	Install	- Install new No.3 66kV Bus X & Y Protection Scheme
66kV Bus Zone 4	Remove	#4 66 X Overcurrent Relay
		#4 66 X Instantaneous Current Relay
		#4 66 X Timer Relay
		#4 66 Y Overcurrent Relay
		#4 66 Y Instantaneous Current Relay
		#4 66 Y Timer Relay
	Install	- Install new No.4 66kV Bus X & Y Protection Scheme
Common Panels	Remove	66kV Feeders Under Frequency Check Relay
		66kV Potential Selector Relay
		66kV Remote Control Synchro Check Relay
		66kV Dynamic System Monitoring Relay
		High Speed Monitoring (Fault Recorder)
	Install	- Install new 66kV Auto Load Shedding Control Scheme
		- Install new 66kV Bus Potential Selectors Scheme
		- Install new 66kV Remote Control Synchro Check Scheme
		- Install new 66kV Dynamic System Monitoring Scheme
		- Install new High-Speed Monitoring Panel

APPENDIX A.2.

The scope to replace selected 22kV switchgear

22kV Bay	Activity	Description (Primary Equipment)
22kV MB28 Feeder	Remove	MB28 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.1 bus side of CB three 22kV disconnector
22kV MB29 Feeder	Remove	MB29 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.2 bus side of CB three 22kV disconnector
22kV BLT30 Feeder	Remove	BLT30 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.3 bus side of CB three 22kV disconnector
22kV BLT31 Feeder	Remove	BLT31 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.3 bus side of CB three 22kV disconnector
22kV BLT15 Feeder	Remove	BLT15 22kV Feeder CB Bus Side (Out of Service)
	Install	- Install one 22kV Feeder Circuit Breaker
22kV BLT16 Feeder	Remove	BLT16 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.1 bus side of CB three 22kV disconnector
22kV BLT17 Feeder	Remove	BLT17 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.1 bus side of CB three 22kV disconnector
22kV BLT19 Feeder	Remove	BLT19 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.1 bus side of CB three 22kV disconnector
	Remove	BLT20 22kV Feeder CB Bus Side Isolator

22kV BLT20 Feeder	Install	- Install on the No.2 bus side of CB three 22kV disconnector
22kV BLT21 Feeder	Remove	BLT21 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.2 bus side of CB three 22kV disconnector
22kV BLT22 Feeder	Remove	BLT22 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.2 bus side of CB three 22kV disconnector
22kV BLT23 Feeder	Remove	BLT23 22kV Feeder CB Bus Side Isolator
	Install	- Install on the No.2 bus side of CB three 22kV disconnector
No.1 22kV Bus VT	Remove	No.1 22kV Bus VT Isolator
	Install	No.1 22kV Bus VT Isolator Switch - Install three single Phase VT Isolator Switch
No.2 22kV Bus VT	Remove	No.2 22kV Bus VT Isolator
	Install	No.2 22kV Bus VT Isolator Switch - Install three Single Phase VT Isolator Switch
No.3 22kV Bus VT	Remove	No.3 22kV Bus VT Isolator
		No.3 22kV Bus VT Fused Isolator (Out of Service)
	Install	No.3 22kV Bus VT Isolator Switch - Install three Single Phase VT Isolator Switch
		- Install three Single Phase VT Fuse Isolator
22kV 2-3 Bus-Tie	Remove	2-3 22kV Bus-Tie CB
		2-3 22kV Bus Tie CB No.2 Bus Side Isolator
		2-3 22kV Bus Tie CB No.3 Bus Side Isolator
	Install	2-3 66kV Bus-Tie Circuit Breaker - Install one 22kV Circuit Breaker 2-3 22kV Bus-Tie CB No.2 Bus Side Isolator - Install on the No.2 bus side of CB three 22kV disconnector

		2-3 22kV Bus-Tie CB No.3 Bus Side Isolator - Install on the No.3 bus side of CB three 22kV disconnector
TEMP No.3 S/S TRANS	Remove	TEMP No.3 22kV/415V Service Station Trans Isolator
	Install	TEMP No.3 22kV/415V Service Station Trans Isolator - Install TEMP No.3 22kV/415V Service Station Trans Isolator

The scope to replace poor condition secondary equipment.

22kV Bay	Activity	Description (Secondary Equipment)
22kV MB28 Feeder	Remove	MB28 X Overcurrent Protection
		MB28 CB BU Current Check Protection
	Install	- Install new MB28 Feeder Protection & Control Scheme
22kV MB29 Feeder	Remove	MB29 CB BU Current Check Protection
	Install	- Install new MB29 Feeder Protection & Control Scheme
22kV Bus Zone 1	Remove	#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
		#1 22 Inverse Time Induction Overcurrent
	Install	- Install new No.1 22kV Bus X & Y BU OC/EF Protection Scheme
22kV Bus Zone 2	Remove	#2 22 Inverse Time Induction Overcurrent
		#2 22 Inverse Time Induction Overcurrent
		#2 22 Extremely Inverse Time Induction Overcurrent
		#2 22 Extremely Inverse Time Induction Overcurrent
		#2 22 Extremely Inverse Time Induction Overcurrent
	Install	- Install new No.2 22kV Bus X & Y BU OC/EF Protection Scheme
	Remove	#3 22 Inverse Time Induction Overcurrent

22kV Bus Zone 3		#3 22 Inverse Time Induction Overcurrent
		#3 22 Inverse Time Induction Overcurrent
		#3 22 Extremely Inverse Time Induction Overcurrent
		#3 22 Extremely Inverse Time Induction Overcurrent
		#3 22 Extremely Inverse Time Induction Overcurrent
	Install	- Install new No.3 22kV Bus X & Y BU OC/EF Protection Scheme
Common Panels	Remove	22kV Dynamic System Monitoring Relay
	Install	- Install new 22kV Dynamic System Monitoring Panel