



REDCLIFFS TERMINAL STATION

TRANSMISSION REVENUE RESET (TRR) PROJECT SCOPING

REVISION B
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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

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EXECUTIVE SUMMARY

AusNet Services engaged APD Engineering to prepare project scopes and estimates relating to options for replacement of poor condition primary equipment at Red Cliffs Terminal Station (RCTS) 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 $\pm 30\%$ and are based on the limitations outlined in Section 2 of this report.

Option	Option Title	Capital Cost (M)
1	Integrated project	\$22.89
2	1A and 2A Transformer Replacement	\$11.51
3	Switchgear replacement	\$11.58

[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 Redcliffs Terminal Station (RCTS) for inclusion in AusNet Services' 2022 – 2027 Transmission Revenue Rese.

The equipment for replacement, along with planning options for consideration have been prepared as per reference [1] – Redcliffs Terminal Station (RCTS) Transformer and Circuit Breaker Replacement Project TD-0008004.

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 Red Cliffs Terminal Station.

A single line diagram of Thomastown has been included as Figure 1 and an aerial view of the terminal station has been included as Figure 2.

4.2. NO 1A AND NO 2A TRANSFORMER WORKS

AusNet Services has identified the need to replace the No 1A and No 2A transformers due to poor condition. The No 1B and No 2B transformers would be used to supply the 22kV load and a new 150MVA transformer to supply the 66kV load.

APD Engineering has reviewed the functional scope provided by AusNet Services. In the proposed scope, APD Engineering has identified that there are physical constraints to the expansion of the yard to accommodate new transformer positions.

Based on loading data provided by AusNet Services, APD Engineering has identified that a long duration outage of a single transformer may be possible at certain times of the year.

Based on a long-duration outage of the No 1A transformer, APD Engineering has identified a possible sequence of work to replace the No 1A and No 2A transformers with a single new 150MVA 220/66kV transformer and to reconfigure the remaining transformers such that:

- No 1B and No 2B transformers provide supply to the RCTS 22kV load;
- The B3 transformer and the new transformer provides supply to the RCTS 66kV load,.

The proposed sequence of works would require:

- Install new 220kV CB in Bay D;
- Connect the existing 1B transformer to the new CB;
- Demolish the existing 1A transformer and 220kV paralleling bus;
- Install a new 150MVA 220/66kV transformer in the existing 1A position;
- Connect the new 150MVA transformer to the previous No 1 transformer CB;

- Reconfigure the 1B and 2B transformers to supply the 22kV load; and
- Demolish the 2A transformer and remaining 220kV paralleling bus.

A detailed scope of works has been prepared to allow capital cost estimation. This scope has been included in Appendix A.

4.3. SWITCHGEAR REPLACEMENT

AusNet Services has identified that there is three poor condition 22kV circuit breakers at Red Cliffs Terminal Station requiring replacement. In addition, there are a number of isolators, instrumentation transformers and earth switches in the 220kV, 66kV and 22kV switchyards that have been identified by AusNet Services 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.

A detailed scope of works has been prepared to allow capital cost estimation. This scope has been included in Appendix B

4.4. PLANNING ESTIMATE

The detailed scope of works has been included in Appendix A and Appendix B of this report. The cost to implement the identified project scope of work as an integrated project has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of \$22.89 M ($\pm 30\%$).

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

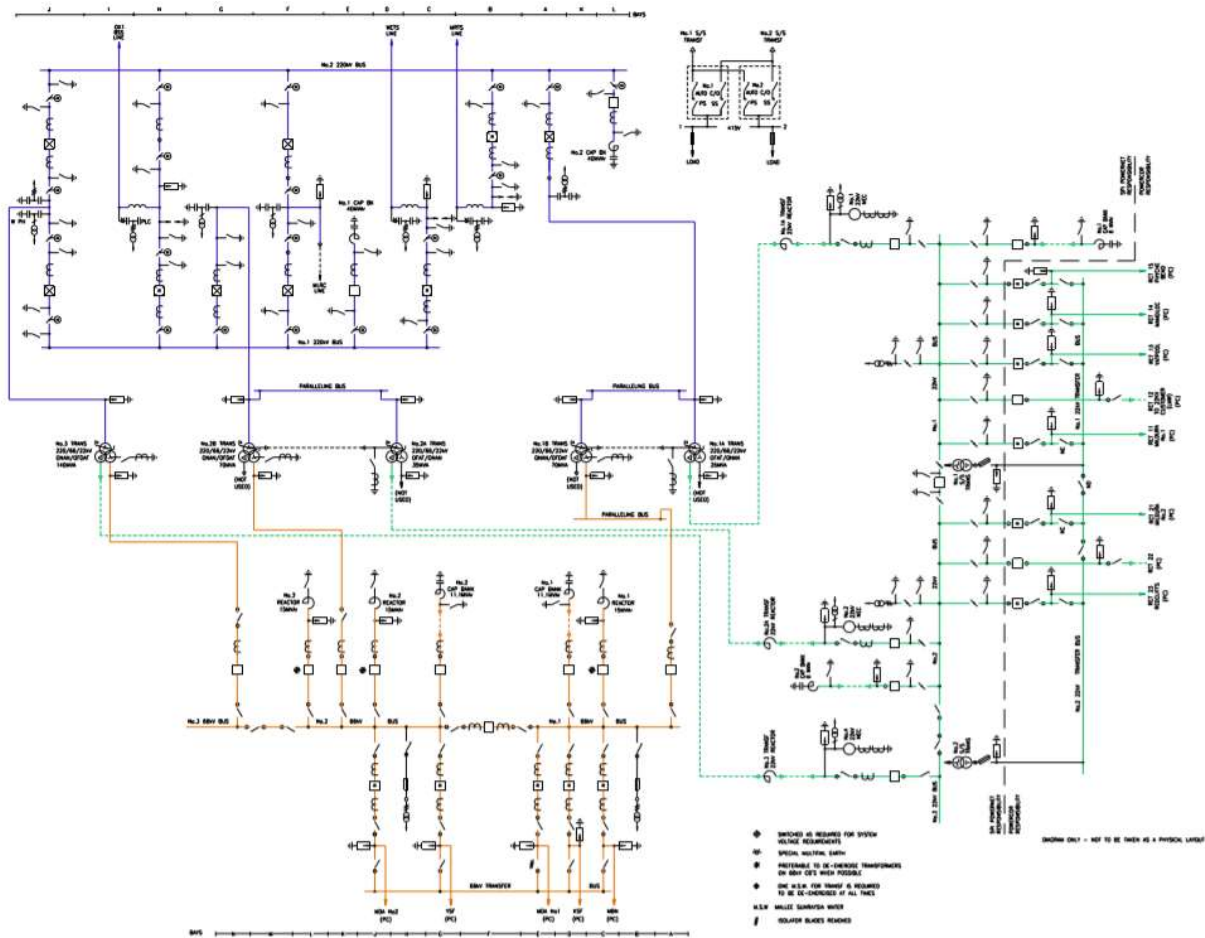


Figure 1 – Red Cliffs Terminal Station SLD



Figure 2 – Red Cliffs Terminal Station Aerial View

5. OPTION 2 – REPLACE NO 1A AND NO 2A TRANSFORMERS

5.1. OUTLINE OF PROJECT

This planning option delivers the replacement of the No 1A and No 2A transformers.

5.2. TRANSFORMER WORKS

The works associated with this option are identical to the transformer works outlined in Option 1.

5.3. PLANNING ESTIMATE

The detailed scope of works has been included in Appendix A of this report. The cost to implement the identified project scope of work has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of \$11.51 M ($\pm 30\%$).

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

6. OPTION 3 – REPLACE SWITCHGEAR ONLY

6.1. OUTLINE OF PROJECT

This planning option delivers the replacement of the poor condition switchgear only.

6.2. SWITCHGEAR REPLACEMENT

The works required as part of this option are identical to those in the integrated option.

6.3. PLANNING ESTIMATE

The detailed scope of works has been included in Appendix B of this report. The cost to implement the identified project scope of work has been estimated using the AusNet Services estimating spreadsheet at a total capital cost of \$11.58 M ($\pm 30\%$).

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	Redcliffs Terminal Station (RCTS) - Transformer and Circuit Breaker Replacement Project TD-0008004
Document	AusNet	Top-down Transmission Estimate for Option Selection Rev 2.7
Document	AusNet	Relays Condition Score Status as off 07.05.2019
Drawing	AusNet	Redcliffs Terminal Station 22kV, 66kV and 220kV Single Line Diagram – T14/31/152

APPENDIX A.

The new B4 Transformer 220/66/22kV 150MVA installation works within RCTS includes the following new primary and secondary assets installation.

APPENDIX A.1.

The primary scope to retire the No.1A and No.2A Transformer and install a new 220/66/22kV 150MVA B4 Transformer in parallel with the existing B3 Transformer supplying the 66kV load. Use the existing No.1B and No.2B Transformer to supply the 22kV load

Trans	Activity	Description (Primary Equipment)
New B4 TRANS	Remove	Decommissioning of 220/66/22kV 35MVA Transformer (1A) and associated 22kV cable feeding into the existing No.1A 22kV Transformer Reactor
		Decommissioning of 220/66/22kV 35MVA Transformer (2A) and associated 22kV cable feeding into the existing No.2A 22kV Transformer Reactor
	Install	New B4 Transformer Installation <ul style="list-style-type: none"> - Install 1 off 220/66/22kV 150MVA Power Transformer (B4) - Install 3 off 220kV Surge Arresters - Install 1 off 220kV Neutral Isolators - Install 3 off 66kV Surge Arresters - Install 1 off 66kV Neutral Isolators - Install 2 off Neutral CT's
Existing 1B TRANS	Install	Install new 22kV cable feeding into the existing No.1A 22kV Transformer Reactor *Note – Rename No.1A Trans Reactor No.1B
Existing 2B TRANS	Install	Install new 22kV cable feeding into the existing No.2A 22kV Transformer Reactor

		*Note – Rename No.2A Trans Reactor No.2B
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220kV Bay	Activity	Description (Primary Equipment)
New B4 TRANS (Bay N)	Install	New B4 TRANS No.1 Bus 220kV CB
		New B4 TRANS No.2 Bus 220kV CB
		New B4 330/220kV TRANS 220kV VT "R, W, B" Phase - Including 3 x Single Phase Post Type 220kV CVT
		New B4 330/220kV TRANS 220kV VT "W" Phase - Including 1 x Single Phase Post Type 220kV CVT
		New B4 TRANS 220kV E/SW
		New B4 TRANS No.1 Bus 220 kV CB Bus Side ROI - Including 1 x integrated earth switch
		New B4 TRANS No.1 Bus 220kV CB TRANS Side ROI - Including 1 x integrated earth switch
		New B4 TRANS No.2 Bus 220 kV CB Line Side ROI - Including 1 x integrated earth switch
		New B4 TRANS No.2 Bus 220 kV CB Bus Side ROI - Including 1 x integrated earth switch
		- Extension of No.1 220kV Busbars (2 Bays)
		- Extension of No.2 220kV Busbars (2 Bays)
		- Install three (3) off 220 kV Surge Arresters
		- Install two (2) off CT Bay Marshalling Boxes
		- Install one (1) off VT Bay Marshalling Boxes
		- Install two (2) off Switchyard GPO and Lighting Marshalling Boxes
- Install new two (2) off Interface Termination Cubicles Bay		

66kV Bay	Activity	Description (Primary Equipment)
New B4 TRANS (Bay Q)	Install	B4 Trans 66kV Circuit Breaker <ul style="list-style-type: none"> - Install one off 66kV Dead Tank Circuit Breaker B4 Trans 66kV Voltage Transformer <ul style="list-style-type: none"> - Including 1 x Single Phase Post Type 220kV CT B4 Trans 66kV Voltage Transformer Fused Isolator "R" Phase only <ul style="list-style-type: none"> - Install one off Single Phase Fused Isolator No.4 Trans 66kV CB No.3 Bus Side Isolator <ul style="list-style-type: none"> - Install on the bus side of CB three off 66kV disconnecter Extension of No.3 66 kV Busbars (2 Bays)

The secondary scope to retire the No.1A and No.2A Transformer and install a new 220/66/22kV 150MVA B4 Transformer in parallel with the existing B3 Transformer supplying the 66kV load. Use the existing No.1B and No.2B Transformer to supply the 22kV load.

220kV Bay	Activity	Description (Secondary Equipment)
New B4 TRANS (Bay N)	Remove/ Modification/ Relocation (Existing Bay G & A)	Decommissioning of No.1A Transformer X & Y Protection & Control Scheme, Relocation of existing 22kV CT's and associated circuits to No.1B Modification and replacement of existing 1B Transformer Protection Relays: <ul style="list-style-type: none"> - 1A/1B TR X DIFF PROT Relay - 1A/1B TR 2B BU 220kV CB Fail & Control - 1A/1B TR 2B 220kV CB Control/Monitor Relay - 1B TR 66kV CB Control/Monitor Relay Decommissioning of existing 1A Transformer Protection Relays:

		<ul style="list-style-type: none"> - 1A 220/66/22KV TR GROUP X Current Check Relay - 1A 220/66/22KV TR GROUP X Current Check Relay - 1A TR 22kV CB Control/Monitor Relay <p>Decommissioning of No.2A Transformer X & Y Protection & Control Scheme, Relocation of existing 22kV CT's and associated circuits to No.2B</p> <p>Modification and replacement of existing 2B Transformer Protection Relays:</p> <ul style="list-style-type: none"> - 2A/2B TR X DIFF PROT Relay - 2A/2B TR 1B BU 220kV CB Fail & Control - 2A/2B TR 2B 220kV CB Control/Monitor Relay - 2B TR 66kV CB Control/Monitor Relay <p>Decommissioning of existing 2A Transformer Protection Relays:</p> <ul style="list-style-type: none"> - 2A 220/66/22KV TR GROUP X Current Check Relay - 2A 220/66/22KV TR GROUP X Current Check Relay - 2A TR 22kV CB Control/Monitor Relay
	Install	<ul style="list-style-type: none"> - Install new one off B4 Transformer X Protection & Control Scheme. - Install new one off B4 Transformer Y Protection & Control Scheme. - Install new one off B4 Transformer No.4 220/66kV No.1 Bus CB Management Scheme. - Install new one off B4 Transformer No.4 220/66kV No.2 Bus CB Management Scheme. - Replace and install new 1B TR X DIFF PROT Relay, 1B TR 2B BU 220kV CB Fail & Control Relay, 1B TR 2B 220kV CB Control/Monitor Relay, 1B TR 66kV CB Control/Monitor Relay - Replace and install new 2B TR X DIFF PROT Relay, 2B TR 1B BU 220kV CB Fail & Control Relay, 2B TR 2B

		220kV CB Control/Monitor Relay, 2B TR 66kV CB Control/Monitor Relay
220kV Transf. B1, B2, B3 and B4	Remove	Decommissioning of existing Transformer Voltage Control Scheme. - 66kV Voltage Regulation/ OLTC Control Relay
	Install	- Install new one-off 220/66kV Transformer Voltage Control Scheme.

APPENDIX B.

The primary scope to replace selected switchgear.

Trans	Activity	Description (Primary Equipment)
Existing B1 TRANS	Remove	No.1 Trans Group 220kV Neutral Isolator
	Install	Existing B1 Transformer Installation - Replace and install 1 off 220kV Neutral Isolators
No 1 Cap Bank	Remove	No 1 220KV CAP BK CB CT (R, W, B)
	Install	No 1 220KV CAP BK CB CT (R, W, B)

66kV Bay	Activity	Description (Primary Equipment)
No.1 Bus VT (Bay B)	Remove	No.1 66kV Bus VT
	Install	No.1 66kV Bus VT, Fused Isolator and Isolator Switch - Install three off Single Phase Post Type 66kV VT
No.2 Bus VT (Bay H)	Remove	No.2 66kV Bus VT
	Install	No.2 66kV Bus VT, Fused Isolator and Isolator Switch - Install three off Single Phase Post Type 66kV VT
No.1 Cap Bank (Bay D)	Remove	No.1 66kV Capacitor Bank CB CT "R" Phase No.1 66kV Capacitor Bank CB CT "W" Phase No.1 66kV Capacitor Bank CB CT "B" Phase No 1 66KV CAP BK BALANCE CT B/PH No 1 66KV CAP BK BALANCE CT R/PH No 1 66KV CAP BK BALANCE CT W/PH
	Install	No.1 66kV Capacitor Bank CB CT "R, W, B" Phase - Install 3 off Single Phase Post Type 66kV CT No 1 66KV CAP BK BALANCE CT B/PH

		No 1 66KV CAP BK BALANCE CT R/PH No 1 66KV CAP BK BALANCE CT W/PH
No.2 Cap Bank (Bay G)	Remove	No.2 66kV Capacitor Bank CB CT "R" Phase No.2 66kV Capacitor Bank CB CT "W" Phase No.2 66kV Capacitor Bank CB CT "B" Phase No 2 66KV CAP BK BALANCE CT B/PH No 2 66KV CAP BK BALANCE CT R/PH No 2 66KV CAP BK BALANCE CT W/PH
	Install	No.2 66kV Capacitor Bank CB CT "R, W, B" Phase - Install 3 off Single Phase Post Type 66kV CT No 2 66KV CAP BK BALANCE CT B/PH No 2 66KV CAP BK BALANCE CT R/PH No 2 66KV CAP BK BALANCE CT W/PH

22kV Bay	Activity	Description (Primary Equipment)
B1 TRANS Reactor (Bay A)	Remove	1A Trans Reactor 22kV CB 1A 220/66/22kV Trans Reactor 22kV CB Isolator 1A Trans Reactor 22kV CB Bus Side Isolator
	Install	1B Trans Reactor 22kV CB - Replace one off 22kV Circuit Breaker 1B 220/66/22kV Trans Reactor 22kV CB Isolator - Replace one off 22kV CB Isolator 1B Trans Reactor 22kV CB Bus Side Isolator - Replace one off 22kV CB Bus Side Isolator *Note – Rename No.1A Trans Reactor No.1B
	Remove	2A Trans Reactor 22kV CB

B2 TRANS Reactor (Bay L)		2A 220/66/22kV Trans Reactor 22kV CB Isolator 2A Trans Reactor 22kV CB Bus Side Isolator
	Install	2B Trans Reactor 22kV CB - replace one off 22kV Circuit Breaker 2B 220/66/22kV Trans Reactor 22kV CB Isolator - Replace one off 22kV CB Isolator 2B Trans Reactor 22kV CB Bus Side Isolator - Replace one off 22kV CB Bus Side Isolator *Note – Rename No.2A Trans Reactor No.2B
B3 TRANS Reactor (Bay P)	Remove	3 Trans Reactor 22kV CB
	Install	3 Trans Reactor 22kV CB - Replace one off 22kV Circuit Breaker
No.1 S/S TRANS (Bay F)	Remove	No.1 22kV/415V Service Station Trans 22kV Fused Isolator
	Install	- Replace one off No.2 22kV/415V Service Station Trans 22kV Fused Isolator
No.2 S/S TRANS (Bay P)	Remove	No.2 22kV/415V Service Station Trans 22kV Fused Isolator
	Install	- Replace one off No.2 22kV/415V Service Station Trans 22kV Fused Isolator
1-2 Bus-Tie (Bay G)	Remove	1-2 22kV Bus-Tie No.1 Bus Side Isolator
		1-2 22kV Bus-Tie No.2 Bus Side Isolator
	Install	1-2 22kV Bus-Tie No.1 Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
		1-2 22kV Bus-Tie No.2 Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
No.1 22kV Bus VT (Bay D)	Remove	No.1 22kV Bus VT
		No.1 22kV Bus VT 22kV Bus Fused Isolator
	Install	No.1 22kV Bus VT and Fused Isolator - Install three off Single Phase Post Type 22kV VT

		- Install three off Single Phase Fused Isolator
No.2 22kV Bus VT (Bay D)	Remove	No.2 22kV Bus VT
		No.2 22kV Bus VT 22kV Bus Fused Isolator
	Install	No.2 22kV Bus VT and Fused Isolator
		- Install three off Single Phase Post Type 22kV VT
		- Install three off Single Phase Fused Isolator
No.1 Cap Bank (Bay A)	Remove	No.1 22kV Capacitor Bank CB Bus Side Isolator
	Install	No.1 22kV Capacitor Bank CB Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
No.2 Cap Bank (Bay B)	Remove	No.2 22kV Capacitor Bank CB Bus Side Isolator
	Install	No.2 22kV Capacitor Bank CB Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
RCT 15 FDR (Bay B)	Remove	RCT 15 CB 22kV Bus Side Isolator
	Install	RCT 15 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
RCT 14 FDR (Bay C)	Remove	RCT 14 CB 22kV Bus Side Isolator
	Install	RCT 14 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
RCT 13 FDR (Bay D)	Remove	RCT 13 CB 22kV Bus Side Isolator
	Install	RCT 13 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
RCT 11 FDR (Bay F)	Remove	RCT 11 CB 22kV Bus Side Isolator
	Install	RCT 11 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter

RCT 21 FDR (Bay H)	Remove	RCT 21 CB 22kV Bus Side Isolator
	Install	RCT 21 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
RCT 23 FDR (Bay K)	Remove	RCT 23 CB 22kV Bus Side Isolator
	Install	RCT 23 CB 22kV Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
LMW No.1 Trans	Remove	LMW No.1 Trans 22kV CB Bus Side Isolator
	Install	LMW No.1 Trans 22kV CB Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter
LMW No.2 Trans	Remove	LMW No.2 Trans 22kV CB Bus Side Isolator
	Install	LMW No.2 Trans 22kV CB Bus Side Isolator - Install on the bus side of CB three off 22kV disconnecter

The secondary scope to replace poor condition equipment.

220kV Bay	Activity	Description (Secondary Equipment)
Existing B3 TRANS	Remove	Decommissioning of B3 Transformer X & Y Protection & Control Scheme
		- B3 TR X DIFF PROT Relay
		- B3 TR Y RESTRICTED EARTH FAULT Relay
		- B3 TR 66kV CB Control/Monitor Relay
		- B3 TR 22kV CB Control/Monitor Relay
		- B3 TR 22kV CB Auto Control Relay
		- B3 TR 1B 220kV CB Control/Monitor Relay
		- B3 TR 1B 220kV CB BU CB Fail & Control Relay
		- B3 TR 2B 220kV CB Control/Monitor Relay
- B3 TR 2B 220kV CB BU CB Fail & Control Relay		

	Install	- Install new one off B3 Transformer X Protection & Control Scheme.
		- Install new one off B3 Transformer Y Protection & Control Scheme.
		- Install new one off B3 Transformer No.2 220/66kV No.1 Bus CB Management Scheme.
		- Install new one off B3 Transformer No.2 220/66kV No.2 Bus CB Management Scheme.
Existing B1 TRANS	Remove	Decommissioning of B1 Transformer Control Scheme - 1B TR 66kV CB Control/Monitor Relay
	Install	- Install new one off B1 Transformer No.1 220/66kV Bus CB Management Scheme.
MLRC Line (Bay F)	Remove	Decommissioning of MLRC Line X & Y Protection & Control Scheme - MLRC X Distance Protection Relay
		- MLRC Y Digital Current Differential
		- MLRC VFRB SYS A CONTROL Relay
		- MLRC VFRB SYS B CONTROL Relay
		- 220KV STATION TRIP OFF TIMER Relay
		Decommissioning of MLRC Line CB Management Scheme - MLRC 1B Y CB Management Relay
		- MLRC 1B CB Control/Monitor Relay
		- MLRC 2B Y CB Management Relay
		- MLRC 2B CB Control/Monitor Relay
		Install
	- Install new one-off MLRC 220kV Line X & Y Protection with ARC Current Diff/Distance Scheme to remote end	
- Install new one-off MLRC 220kV Line No.1 Bus CB Management (CB Fail & Control) Scheme		

		<ul style="list-style-type: none"> - Install new one-off MLRC 220kV Line No.2 Bus CB Management (CB Fail & Control) Scheme
BSS Line (Bay H)	Remove	Decommissioning of BSS Line X Protection & Control Scheme
		<ul style="list-style-type: none"> - BSS X Distance Relay
		<ul style="list-style-type: none"> - BSS TIE ISOL X High Set Current Check
		<ul style="list-style-type: none"> - BSS TIE ISOL Low Set Current Check Relay
		<ul style="list-style-type: none"> - BSS BU TIE ISOL High Set Current Check
		<ul style="list-style-type: none"> - BSS BU REM TP Negative Sequence Interlock Relay
		<ul style="list-style-type: none"> - BSS BU REM TP Positive & Zero Sequence Interlock Relay
		<ul style="list-style-type: none"> - BSS BU CB PROT O/C & CB Fail Protection & Control
	Decommissioning of BSS Line CB Management Scheme	
	<ul style="list-style-type: none"> - BSS 1B CB Control/Monitor Relay 	
	Install	Decommissioning of BSS Dynamic System Monitor
		<ul style="list-style-type: none"> - BSS Dynamic System Monitor
		<ul style="list-style-type: none"> - Install new one-off BSS 220kV Line X Protection with ARC Current Diff/Distance Scheme
		<ul style="list-style-type: none"> - Install new one-off BSS 220kV Line X Protection with ARC Current Diff/Distance Scheme to remote end
		<ul style="list-style-type: none"> - Install new one-off BSS 220kV Line Bus CB Management (CB Fail & Control) Scheme
WETS Line (Bay C)	Remove	Decommissioning of WETS Line X Protection & Control Scheme
		<ul style="list-style-type: none"> - WETS X Distance Relay - WETS X CB Fail, Auto Reclose, Synch - WETS 220KV L Volt Monitor Alarm Relay
		Decommissioning of WETS Line CB Management Scheme
		<ul style="list-style-type: none"> - WETS BU CB Management Relay - WETS 1B CB Control/Monitor Relay

		Decommissioning of WETS Dynamic System Monitor <ul style="list-style-type: none"> - WETS Dynamic System Monitor
	Install	<ul style="list-style-type: none"> - Install new one-off WETS 220kV Line X Protection with ARC Current Diff/Distance Scheme - Install new one-off WETS 220kV Line X Protection with ARC Current Diff/Distance Scheme to remote end - Install new one-off WETS 220kV Line Bus CB Management (CB Fail & Control) Scheme
MRTS Line (Bay B)	Remove	Decommissioning of MRTS Line X & Y Protection & Control Scheme <ul style="list-style-type: none"> - MRTS X Protection Relay - MRTS Y Protection Relay - MRTS 220KV L Volt Monitor Alarm Relay - MRTS 220KV L BACKUP Protection Relay Decommissioning of MRTS Line CB Management Scheme <ul style="list-style-type: none"> - MRTS 2B CB Control/Monitor
	Install	<ul style="list-style-type: none"> - Install new one-off MRTS 220kV Line X & Y Protection with ARC Current Diff/Distance Scheme - Install new one-off MRTS 220kV Line X & Y Protection with ARC Current Diff/Distance Scheme to remote end - Install new one-off MRTS 220kV Line Bus CB Management (CB Fail & Control) Scheme
220kV Bus Zone	Remove	Decommissioning of existing No.1 220kV Bus X & Y Protection Scheme
		- #1 220kV X High Impedance Differential Relay
		- #1 220kV Y High Impedance Differential Relay
		- #1 220kV BU Bus Fault Backup Timer Relay
		- #1 220kV BU CB Backup Timer Relay
Decommissioning of existing No.2 220kV Bus X & Y Protection Scheme		

		- #2 220kV X High Impedance Differential Relay
		- #2 220kV Y High Impedance Differential Relay
		- #2 220kV BU Bus Fault Backup Timer Relay
		- #2 220kV BU CB Backup Timer Relay
	Install	- Install new one-off No.1 220kV Bus X Protection Scheme
		- Install new one-off No.1 220kV Bus Y Protection Scheme
		- Install new one-off No.2 220kV Bus X Protection Scheme
		- Install new one-off No.2 220kV Bus Y Protection Scheme
No.1 Cap Bank (Bay E)	Remove	Decommissioning of No.1 Capacitor Bank X & Y Protection & Control Scheme <ul style="list-style-type: none"> - #1 220kV CAP Bank X Overcurrent & Unbalance - #1 220kV CAP Bank X Overcurrent & Unbalance - #1 220kV CAP Bank X Overcurrent & Unbalance - #1 220kV CAP Bank Y O/C E/F CB Fail & Control - #1 220kV CAP Bank X O/C, E/F, CB Fail & Control Decommissioning of No.1 Capacitor Bank CB Management Scheme <ul style="list-style-type: none"> - #1 220kV CAP Bank CB Control/Monitor Relay
	Install	Install new one-off No.1 Capacitor X & Y Protection & Control Scheme. <ul style="list-style-type: none"> - Install new one-off No.1 Capacitor Bus CB Management (CB Fail & Control) Scheme
No.2 Cap Bank (Bay L)	Remove	Decommissioning of No.2 Capacitor Bank X & Y Protection & Control Scheme <ul style="list-style-type: none"> - #2 220kV CAP Bank X Overcurrent & Unbalance
		- #2 220kV CAP Bank X Overcurrent & Unbalance
		- #2 220kV CAP Bank X Overcurrent & Unbalance

		- #2 220kV CAP Bank Y O/C E/F CB Fail & Control
		- #2 220kV CAP Bank X O/C, E/F, CB Fail & Control
		Decommissioning of No.2 Capacitor Bank CB Management Scheme - #2 220kV CAP Bank CB Control/Monitor Relay
	Install	Install new one-off No.2 Capacitor X & Y Protection & Control Scheme. - Install new one-off No.2 Capacitor Bus CB Management (CB Fail & Control) Scheme

66kV Bay	Activity	Description (Secondary Equipment)
66kV Bay D	Remove	KSF Y Distance Relay
		KSF CB Control/Monitor Relay
	Install	- Install new one-off KSF Feeder Y Protection & Control Scheme
		- Install new one-off KSF Feeder Y Protection & Control Scheme to Remote End
	- Install new one-off KSF Feeder CB Management (CB Fail & Control) Scheme	
66kV Bay J	Remove	MDA No.2 Y Distance Relay
	Install	- Install new one-off MDA No.2 Feeder Y Protection & Control Scheme
		- Install new one-off MDA No.2 Feeder Y Protection & Control Scheme to Remote End
66kV Bay E	Remove	MDA No.1 CB Control/Monitor Relay
	Install	- Install new one-off MDA No.1 Feeder CB Management (CB Fail & Control) Scheme
		- Install new one-off MDA No.1 Feeder CB Management (CB Fail & Control) Scheme to Remote End

66kV Bay G	Remove	YSF Y Distance Relay
		YSF CB Control/Monitor Relay
	Install	- Install new one-off YSF Feeder Y Protection & Control Scheme
		- Install new one-off YSF Feeder Y Protection & Control Scheme to Remote End
- Install new one-off YSF Feeder CB Management (CB Fail & Control) Scheme		
66kV Bay C	Remove	MBN X Distance Relay
		MBN Y Distance Relay
		MBN Y Sensitive Leakage Relay
		MBN CB Control/Monitor Relay
	Install	- Install new one-off MBN Feeder X & Y Protection & Control Scheme
		- Install new one-off MBN Feeder X & Y Protection & Control Scheme to Remote End
		- Install new one-off MBN Feeder CB Management (CB Fail & Control) Scheme
66kV Bus Zone	Remove	Decommissioning of existing No.1 66kV Bus X & Y Protection Scheme
		- #1 66kV X High Impedance Differential Relay
		- #1 66kV Y High Impedance Differential Relay
		Decommissioning of existing No.2 66kV Bus X & Y Protection Scheme
		- #2 66kV X High Impedance Differential Relay
		- #2 66kV Y High Impedance Differential Relay
	Install	- Install new one-off No.1 66kV Bus X Protection Scheme
- Install new one-off No.1 66kV Bus Y Protection Scheme		

		<ul style="list-style-type: none"> - Install new one-off No.2 66kV Bus X Protection Scheme
		<ul style="list-style-type: none"> - Install new one-off No.2 66kV Bus Y Protection Scheme
66kV Bay D	Remove	#1 66kV CAP Bank O/C E/F CB Fail & Control #1 66kV CAP Bank Overload & Current #1 66kV CAP Bank Overload & Current #1 66kV CAP Bank Overload & Current #1 66kV CAP Bank X Current Balance Relay #1 66kV CAP Bank Y O/C E/F CB Fail & Control #1 66kV CAP Bank CB Control/Monitor Relay
	Install	<ul style="list-style-type: none"> - Install new one-off No.1 Capacitor X & Y Protection & Control Scheme
		<ul style="list-style-type: none"> - Install new one-off No.1 Capacitor CB Management (CB Fail & Control) Scheme
66kV Bay G	Remove	#2 66kV CAP Bank X O/C E/F CB Fail & Control #2 66kV CAP Bank X Overload & Current #2 66kV CAP Bank X Overload & Current #2 66kV CAP Bank X Overload & Current #2 66kV CAP Bank X Current Balance Relay #2 66kV CAP Bank Y O/C E/F CB Fail & Control #2 66kV CAP Bank CB Control/Monitor Relay
	Install	<ul style="list-style-type: none"> - Install new one-off No.2 Capacitor X & Y Protection & Control Scheme
		<ul style="list-style-type: none"> - Install new one-off No.2 Capacitor CB Management (CB Fail & Control) Scheme
66kV Bay F	Remove	#1-2 66KV BUS TIE CB Control/Monitor Relay
	Install	<ul style="list-style-type: none"> - Install new one-off No.1-2 66kV Bus-Tie CB Management Scheme.
66kV	Remove	#1 66kV Reactor CB Control/Monitor Relay

Bay C	Install	- Install new one-off #1 Reactor 66kV CB Management Scheme
66kV	Remove	#2 66kV Reactor CB Control/Monitor Relay
Bay J	Install	- Install new one-off #2 Reactor 66kV CB Management Scheme
66kV	Remove	#3 66kV Reactor CB Control/Monitor Relay
Bay L	Install	- Install new one-off #3 Reactor 66kV CB Management Scheme
Common Panels	Remove	66kV Auto Load Shedding Timer Relay
		66kV Feeders Under Frequency Check Relay
		66kV Load Shedding Under Frequency Relay
		66kV Potential Selectors Relay
	Install	<ul style="list-style-type: none"> - Install new one-off 66kV Auto Load Shedding Control Scheme. - Install new one-off 66kV Bus Potential Selectors Scheme.