

Title: **PTM&C DETAIL DESIGN DOCUMENT**

Project Name: **Mookodi 1st 500MVA Transformer project**

Project Number: **N.ETMOOKO.C.NW.INT.TE.PT**

Substation Name: **Mookodi**

Transmission Grid: **Northern Grid**

Area of Applicability: **Engineering**

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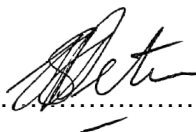
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## 1. PROJECT DESCRIPTION

The Department of Mineral Resources and Energy released the 2019 Integrated Resource Plan (IRP 2019) in October 2019. The IRP 2019 will see around 6 GW of new solar PV capacity and 14.4 GW of new wind power capacity commissioned by 2030. The 2020 TDP Generation Assumptions allocated generation capacity across the country in line with the IRP 2019. Due to the favourable sun and wind in the Northern Cape, the province has around 3.3 GW of committed renewable generation with over 10 GW expected by 2030.

The study has highlighted the need for substantial infrastructure investment and the business is required to respond to the aggressive plans for the country to achieve a diversified energy mix by 2030.

In this light, it is crucial that all project development activities are prioritised on each of the required project schemes, at least to a point of execution readiness. The minimum strengthening required in the

Northern Cape Province to meet the IRP 2019 renewable generation integration aspirations is summarized in the Grid Planning report GP-20/206.

Mookodi 400/132kV Substation is located outside Vryburg in the North West province. The substation is linked to the Transmission grid through Ferrum and Mercury substations via the 400kV lines that connect to the 400kV Busbar. At present the Mookodi substation is supplying the Vryburg Munic and Bophirima substations. Mercury substation supplies Mookodi, which then supplies Ferrum substation. A line reactor is installed on the Mercury line. There is also the Waterloo IPP that feeds into Mookodi MTS.

## 2. SUPPORTING CLAUSES

### 2.1 SCOPE

This document provides an overview of the Secondary plant Engineering processes followed and the system design status. The document includes the technical assessments to determine compliance with the Grid Code and stakeholder requirements. This document does not provide design cost, schedule or other project management type information.

#### 2.1.1 Purpose

This document is to state the concept design that will be employed to achieve the proposed scope of work. It specifies the technologies that will be used during the detail design phase of the project. The document is thus necessary for use as a reference during the detail design phase.

#### 2.1.2 Applicability

This document shall apply to all Transmission Grids.

### 2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

#### 2.2.1 Normative

- ISO 9001 Quality Management Systems.
- See documents listed under Related/Supporting Documents.
- Grid Planning URS.

#### 2.2.2 Informative

- See **Reference Documents** bullet Point

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## 2.3 DEFINITIONS


### 2.3.1 Disclosure Classification

**Controlled disclosure:** controlled disclosure to external parties (either enforced by law, or discretionary)

## 2.4 ABBREVIATIONS

Abbreviation	Description
A	Amps
AUX	Auxiliary
BZ	Bus Zone
CB	Circuit Breaker
CCRA	Condition Criticality Assessment
CLN	Customer Load Network
CT	Current Transformer
CVT	Capacitive Voltage Transformer
DC	Direct Current
ES	Earth Switch
HV	High Voltage
JB	Junction Box
kA	Kilo Amps
kV	Kilo Volts
LH	Left Hand
LT	Line Trap
M	Metering
MTS	Main Transmission Substation
OEM	Original Equipment Manufacturer
P	Protection
PDE	Power Delivery Engineering
PTM&C	Protection, Telecommunications, Metering & Control
RH	Right Hand
SED	Station Electric Diagram
URS	User Requirement Specification
V	Volts

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## 2.5 ROLES AND RESPONSIBILITIES

The PTM&C Designer is responsible to ensure that the Secondary plant requirements for the project are adhered to.

## 2.6 RELATED/SUPPORTING DOCUMENTS

Document Type/Title	Drawing / Document Number	Revision Number	Originator
Mookodi Station Electric Diagram	MOO21P05-SE-D6	0	C Thomas
Mookodi Key Plan	MOO21P05-SE-D7	0	C Thomas
SURS/PLANNING URS	SURS Kimberley Strengthening Phase 3 (GP_20/206).	0	C Naidoo
GRID PLANNING Report	GP 20/206	0	C Naidoo
Substation Engineering Detail Design Report	Moo21P05-SE-D87	Rev 1	<b>C Thomas</b>

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### 3. PRIMARY PLANT INFORMATION

#### PRIMARY PLANT EQUIPMENT

Substation Name:	System Voltage (kV)	Rated normal current (A, minimum)	Short-circuit withstand current (kA, minimum)	CT Bus Zone Ratio	BIL (kV, minimum)	Minimum Specific creepage distance (mm/kV, min)
Mookodi	400	4000A	50	1/1600	1550	25
	132	3150	40	1/1200	550	25

**Info obtained from Substation Design Report**

#### 3.1 FAULT LEVELS

Substation Name:	System Voltage (kV)	1 $\Phi$ fault level (KA)		3 $\Phi$ fault level (kA)		Earthmat Design Fault current (kA) (For Touch & Step)
		Current	New (2026)	Current	New (2026)	
Mookodi	400	4.56	8.37	5.09	8.67	25
	132	12.24	23.88	8.5	16.10	40

**Info obtained from Substation Design Report**

### 4. HIGH LEVEL SCOPE

#### 4.1 SCOPE OF CONCEPT DESIGN

##### 4.1.1 132 kV yard

QTY	BAY	SCOPE OF WORK
1	Bus Coupler A	Fully equipped Bus Coupler bay.
1	B/B1 Bus Section 2	Fully equipped Bus Coupler bay.

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1	Transformer 1	Fully equipped transformer bay with double busbar selection.
1	Busbar 1B VT's	Equip Busbar 1B with VT's.

#### 4.2 400KV YARD

1	B/B1 Bus Section 2	Fully equipped Bus Section bay
1	Bus Coupler A	Fully equipped Bus Coupler bay.
1	Transfer Bus Coupler A	Fully equipped Transfer Bus Coupler bay.
1	Transformer 1	Fully equipped transformer bay with double busbar selection.
1	Transfer Busbar CVT's	Equip Busbar 1 and 2 with CVT's.

#### 4.3 STATION DC VOLTAGE

Item	MTS	Station DC Voltage
1	Mookodi	110V

### 5. SECONDARY PLANT REQUIREMENTS

#### 5.1 400KV SYSTEM

##### 5.1.1 400/132/22KV Transformer 14

Discipline	Requirements
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<b>5.1.1.1</b>	6TA-2300-M1 Auto Transformer Protection with 1 x LoZ REF and 6TA-2300-M2 Auto Transformer Protection with 1 x HiZ REF DGA and Dry Keep to be included 1 x 6JB#100 1 x 6JB#300 1 x 6JB#200 7x PIU 2x Panels Cables
<b>5.1.1.2 Control</b>	Ethernet Switch Patch Panels Patch Boxes Patch Leads 12 core MM Fibre Optic Cables with accessories
<b>5.1.1.3 Measurements</b>	Incoporated in the protection scheme
<b>5.1.1.4 Teleprotection</b>	N/A

**5.1.2 400kV Bus Coupler A** [Click here to enter text.](#)

<b>Discipline</b>	<b>Requirements</b>
<b>5.1.2.1 Protection</b>	6BC-2210-M1 and M2 Bus Coupler Prot without Transfer 6JB-#100 Small Breaker PIU Junction Box with Main 1 and 2 PIUs Control Cables
<b>5.1.2.2 Control</b>	2 x Fibre Patch Boxes (takes two fibres per patch panel) Ethernet Switch
<b>5.1.2.3 Measurements</b>	Incoporated in the protection scheme
<b>5.1.2.4 Teleprotection</b>	Not Applicable.

**5.1.3 400kV Transfer Bus Coupler A** [Click here to enter text.](#)

<b>Discipline</b>	<b>Requirements</b>
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<b>5.1.3.1 Protection</b>	6BC-2310-M1 and M2 Bus Coupler Prot with Transfer 6JB-#100 Small Breaker PIU Junction Box with Main 1 and 2 PIUs Control Cables
<b>5.1.3.2 Control</b>	2 x Fibre Patch Boxes (takes two fibres per patch panel) Ethernet Switch
<b>5.1.3.3 Measurements</b>	Incorporated in the protection scheme
<b>5.1.3.4 Teleprotection</b>	Not Applicable.

#### 5.1.1 400kV Busbar 1 Bus Section 2 [Click here to enter text.](#)

<b>Discipline</b>	<b>Requirements</b>
<b>5.1.1.1 Protection</b>	6BC-2210-M1 and M2 Bus Coupler Prot 6JB-9100 Breaker PIU Junction Box with Main 1 and 2 PIUs Control Cables
<b>5.1.1.2 Control</b>	2 x Fibre Patch Boxes (takes two fibres per patch panel) Ethernet Switch
<b>5.1.1.3 Measurements</b>	Incorporated in the protection scheme
<b>5.1.1.4 Teleprotection</b>	Not Applicable.

#### 5.1.2 400V Transfer Busbar VT JB

<b>Discipline</b>	<b>Requirements</b>
<b>5.1.2.1 Protection</b>	1x JB0602 Interface to new primary equipment New cables
<b>5.1.2.2 Control</b>	None
<b>5.1.2.3 Measurements</b>	None
<b>5.1.2.4 Teleprotection</b>	None

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## 5.2 132KV SYSTEM

### 5.2.1 132kV Bus Coupler A [Click here to enter text.](#)

Discipline	Requirements
<b>5.2.1.1 Protection</b>	6BC-2010 Bus Coupler Prot Single Panel with Transfer 6JB-9300 Small Breaker PIU Junction Box with Main 1 PIU Control Cables
<b>5.2.1.2 Control</b>	2 x Fibre Patch Boxes (takes two fibres per patch panel) Ethernet Switch
<b>5.2.1.3 Measurements</b>	Incorporated in the protection scheme
<b>5.2.1.4 Teleprotection</b>	Not Applicable.

### 5.2.2 132kV Busbar 1 Bus Section 1 [Click here to enter text.](#)

Discipline	Requirements
<b>5.2.2.1 Protection</b>	6BC-2910 Bus Coupler Prot Single Panel without Transfer 6JB-9300 Small Breaker PIU Junction Box with Main 1 and 2 PIUs Control Cables
<b>5.2.2.2 Control</b>	2 x Fibre Patch Boxes (takes two fibres per patch panel) Ethernet Switch
<b>5.2.2.3 Measurements</b>	Incorporated in the protection scheme
<b>5.2.2.4 Teleprotection</b>	Not Applicable.

### 5.2.3 132V Busbar 1A VT JB

Discipline	Requirements
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<b>5.2.3.1 Protection</b>	JB0902 New cables
<b>5.2.3.2 Control</b>	None
<b>5.2.3.3 Measurements</b>	None
<b>5.2.3.4 Teleprotection</b>	None

### 5.3 COMMON YARD REQUIREMENTS

<b>5.3.1 Auxiliary/Construction Supply</b>	Existing
<b>5.3.2 AC Reticulation</b>	TDB Type 1
<b>5.3.3 Eskom Telecoms</b>	Existing
<b>5.3.4 Operating Floodlighting/ Security Lighting</b>	Existing
<b>5.3.5 Safety and Security</b>	Fence extension required & associated equipment

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<b>5.3.6 Control Room</b>	
<b>5.3.6.1 Protection</b>	Interface with the existing 400kV and 132kV Bus Zone scheme
<b>5.3.6.2 Tele-Control (SCADA)</b>	Existing FSP, Fibre Patch panels, Fibre Patch Leads, Fibre Optic Cables 6AGW-2101 Gateways Panel M1 & M2 6AHMI-2100 HMI Server Module M1 & M2 Backbone Router Interlocking new bays Update configurations and database
<b>5.3.6.3 Teleprotection</b>	N/A
<b>5.3.6.4 Metering</b>	Interface 1 meter point scheme (main & check) on the existing ITM panel QOS update
<b>5.3.6.5 DC Systems (50V)</b>	Existing
<b>5.3.6.6 DC Systems (110V)</b>	Existing
<b>5.3.6.7 Under-frequency load shedding</b>	N/A
<b>5.3.7 Office Furniture</b>	New furniture

## 5.4 RELATED PROJECTS

In addition, related or special projects that may impact the scope and design of the project being reported on are considered. The projects mentioned below were considered:

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- Kimberley Strengthening Phase 3 (NWMoo12P02) – Concept
- Watershed B (Mahikeng) Tx and Dx integration (Moo17P04) – Detail
- Cape Corridor Phase 5 – Concept

#### SPECIAL PROJECTS

- None.

### 6. DESIGN PHILOSOPHY

Reliability is the probability that a component, system or process will function without failure as required under stated conditions or design parameters for a stated period of time as per our **Reliability Engineering Manual (Unique Identifier :474-37)** and 240-53458797 PCM for PTMC.

The effects of failures on the protection scheme to be used for this project will be minimized with a “good” level of maintainability (a measure of how quickly the product can be repaired). All specifications submitted to our protection scheme suppliers ensure that the supplier have done everything that they can to provide Eskom with the best possible products. The equipment was evaluated throughout the design process and the analysis of failures in Eskom is another important source of reliability information.

This PCM (240-53458797) deals with the following:

- Perform PTM&C Systems Engineering
- Apply Selected Teleprotection Systems
- Select Technical Solutions
- Create Bill of Works for Cabling and Redundant Equipment
- Perform Settings
- Perform PTMC Detailed Design
- Determine Telecommunications Network Capability
- Establish Greenfield Feasibility
- Perform Telecommunications Pre-engineering

### 7. MAINTENANCE PHILOSOPHY

Maintenance of Eskom’s generation and network assets will be planned and executed ensuring that the following needs are met:

- Safety of people
- High reliability of assets
- Increase customer satisfaction

Approved maintenance plans shall include the following:

- Confirmation of resource availability to execute the plan
- Uninterruptable work, including resources, will not be interrupted due to emergency work
- Contingency plans will be developed for emergency work and resources

This will be done as per the Eskom Maintenance Policy: **unique identifier: 32-1205**

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## 8. OPERATING PHILOSOPHY

The main function of equipment protection is to selectively and rapidly detect and disconnect a fault on the protected circuit to:

- Ensure optimal power quality to customers
- Minimise damage to the faulted primary plant
- Sustain stability and integrity of the power system
- Limit safety hazard to the power utility personnel and the public
- Prevent damage to healthy equipment that conducts fault current during faults.

### Operational philosophy ref: SPL46-101

This will be in line with the Eskom Operating Regulations for High Voltage Systems (ESKPVAEY6)

## 9. EXPECTED LIFE CYCLE

All materials are selected in such a manner as to prolong the life of the equipment and combat the corrosive effects of the environment. Same procedure will be done for this project as our protection scheme normally has a 10 to 20 year life cycle

## 10. TECHNOLOGY

Protection schemes and Tele – Control equipment are all available from existing Transmission National Contracts which were obtained using the **Secondary Plant Technology Development Procedure (474 – 313)** and **Process for Secondary Plant Technology Management (41-714)**

- Fe Protection Contract – TRP004 (460000487 TX)
- Bus Coupler Protection Contract – BCP003 (4600002044 TX)
- Bus Zone Protection Contract – LBP003 (4600001551 TX)
- Tele – Control Contract– SCS002 (4600001083 TX)
- ION Metering Contract – TMS002 (4600001113 TX)
- Transducer Contract – DTC002 (4600001580 TX)
- Disturbance Recorder Contract – DFR002 (4600000711 TX)
- TWS Recorder Contract – TWS001 (4600001283 TX)
- Junction Box Contract – 4600057494

## 11. PROCESSES

Various processes and guidelines were developed to guide the Engineering Design disciplines (see PDE Design Review Process and PLCM Overview files) for **Value Engineering** and **Design Simplification**, 240-53458797 PCM for PTM& C.

### 11.1 FUNCTIONAL SCOPE

To review available standard designs and select the appropriate design that will suit site conditions and stakeholder requirements. Protection settings are calculated to ensure correct operational levels for protective devices. The Power Line Carrier (PLC) frequencies, optical fibre driver types or microwave requirements are determined.

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Cable schedules are created and redundant equipment is identified. Detailed designs are created to include site specific drawings, databases and configurations for metering and control. Further Telecommunications sites are analysed and selected based on availability and usability. Telecommunications pre-engineering work is determined including geotechnical, structural, environmental requirements and the need for applications for permits and approvals. The design review process for the standard designs used are captured in 47-313

## 11.2 SETTINGS REQUEST PROCEDURE

A Setting Request Form: Doc No.: **SPF 0001** must be completed for each bay settings are required. All the required information including equipment nameplate details and pictures must be included with the request.

The assigned protection settings engineer obtains all the information necessary for correct setting calculations and applicability. The settings are then calculated according to the latest philosophy, using sound engineering principles. Pre-written programs may be used as a guide.

After calculation of the settings, it is important that another competent person checks them. The persons who calculate and who check the settings both sign the settings document.

Details of the settings calculation process are included in document **TRMSOP038 "Protection Settings Management Procedure"**.

The PSOP department keeps the settings sheets with original signatures and files a copy of the settings on the database.

The settings are issued to the applicable Transmission Grid, addressed to the relevant Secondary Plant Manager. After the setting is implemented, the applicable Transmission Grid informs the PSOP department in writing.

Only in cases of extreme urgency may an electronic message be used to request a setting change. Such communication will be specific on the change that needs to be done, and the bay on which such a change must be made. Updated setting documentation must then follow as soon as possible.

## 12. PROTECTION SCHEME DESIGN CRITERIA

The protection system shall be based on the principle of main and back-up protection.

Each of the dual-redundant protection systems, Main1 and Main 2, must be connected to separate DC auxiliary supplies.

The purpose of protection is to detect faults that the equipment can be exposed to timeously and to initiate appropriate tripping action.

The main requirements of this protection are following:

- Maximum sensitivity.
- Stability for load conditions.
- Stability for through-fault conditions.
- Stability for magnetising inrush with its accompanying decaying DC offset.

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### 13. DESIGN AND MATERIAL ALTERNATIVES CONSIDERED/REJECTED

All protection schemes to be used are available on Transmission National Contracts and schemes used for this project will be determined by the capacity of the transformers as well as the substation layout design and according to the Electrical Area classification – Class IV according to the **Standard for Electronic Protection and Fault Monitoring equipment (TST41-1062) Section 2.1.5.2 Table 3**. The design and testing of the relays shall also comply with the **Standard for Electronic Protection and fault monitoring equipment (TST41-1062)**

The process for establishing these contracts as outlined in section 5(above) ensures that the best design alternatives have been considered for each type of application as specified in the equipment list.

### 14. SPECIFICATIONS

All protection equipment used is selected such that:

- It is standardised
- It is proven technology
- It shall be purchased from reputable suppliers
- It has built in self-diagnostics
- It is maintainable without the need for special tools and equipment.
- It has continuous monitoring systems which detects and provide indication of each failure

### 15. EQUIPMENT LIST

Refer to Appendix A for a list of all PTM&C Equipment to be installed

### 16. EQUIPMENT SELECTION CRITERIA

Equipment selection is based on the following criteria

- Technical suitability – Fit for intended use/purpose
- Life cycle cost, including the efficient use of electrical energy
- Capital cost
- Supplier support
- Standardisation

And the supplier have been evaluated and accredited by the Eskom team

### 17. CONTROL PHILOSOPHY

Mode of control will be either local or remote. Local control will have auto and manual mode. In auto mode the relays will do controls as per the uploaded settings e.g. tap changer control circuit tap up or down due to voltage required

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by the system. Manual mode control is from human action and could be in the form of push button or Operator in the Substation using Keypad or Laptop.

Remote control mode is done by National and Regional control centre via SCADA provided the local/remote switch is selected on remote. All safety and process interlocks to be maintained in the event of accidental control of equipment under such remote control. Viewing all alarms and condition status of the equipment will also be done local and remote. Control isolation shall be affected via a local/remote switch. Each control output signal will have a feedback indication to indicate a successful operation

## 18. TRAINING

Due to the unlikely availability of the skills required, the project must include for the costs associated with the training of two support persons including courses and might be required to be present during the factory acceptance test.

## 19. EQUIPMENT AND UTILITY REQUIREMENTS

Protection panels to be build according to **Eskom's Standard for Electronic Protection and fault monitoring equipment TST41-1062 Item 2.2.13.**

Protection scheme panels (1 or 2 x 600/800mm) will be installed in the control rooms. Substation battery voltage is 220/110V DC, therefore the new protection scheme relays will be rated 220/110V DC supplied from the existing DC board (Main 1 and 2).

15A Plug sockets installed on the panels will be supplied from an earth leakage protected supply from the AC Board and looped between the panels. Inside the yard, this will be supplied from the Plug Boxes, where an Earth Leakage is installed, to the newly installed junction boxes. 230V AC supplies is also required and supplied from the installed AC Board inside the control room to the respective protection equipment.

All AC/DC installations shall be done and Certificates of Compliance (CoC) and / or Inspection and Test Certificates (ITC) issued in accordance with the COMPLIANCE OF LV AUXILIARY SUPPLY NETWORKS IN SUBSTATIONS Position Paper Nr. 240 - 64139234

## 20. ELECTRICAL SPECIFICATIONS

Heaters will be provided in each junction box and will be permanently energized. These heaters are required to keep the temperature in the cubicle above the dew point.

Gland plates will be properly sealed and all unused holes will be securely closed off (PVC plugs are not acceptable). Gland plates will be adequately protected against rust and oxidation.

Door rubber seals will be made from rubber and be securely glued into place.

Terminals must comply with Eskom's Standard for Electronic Protection and fault monitoring equipment TST41-1062, clause 2.2.14. Earthed wrist straps shall be worn by personnel removing any electronic Components/cards from protection relays

## 21. CADD/MODEL REQUIREMENTS

Drawings are cadded using the micro station software and once checked and signed off, the CAD operator register them on the Eskom Directa system as per the Drawing office standard (TST41-634) and according to Eskom's Standard for Electronic Protection and fault monitoring equipment TST41-1062 Item 2.3.3. This is only done by the authorised person using his or her personal provided password. Software (i.e. PCM600) and cables will be provided to communicate with protection relays.

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## 22. TRANSPORTATION AND STORAGE REQUIREMENTS

The scheme shall be packed in a high specification impact resistance Corrugated cardboard box or wooden crate. The packaging shall be waterproof and shall protect the contents from reasonable transport related wear and tear. It shall be clearly marked and where cabinet door locks, front panel switches etc. may cause damage to the packaging, these shall be removed and placed in a suitable plastic bag and securely tied to the interior of the cabinet for fitment on site.

Current Transformers have to be handled and **transported with care according to TPC41-542** - Procedure for Inspection of Current Transformers Item 12 & 13.

The location in which equipment may be stored / installed will be specified by the supplier (Temperature and Humidity).

## 23. PRE-COMMISSIONING AND HANDOVER SEQUENCE REQUIREMENTS

Pre-commissioning and Commissioning (Energizing) tests will be as per **Standard for Commissioning Protection Assets (240-54615413)**, before handing over the equipment to the Grid or System Operations.

## 24. FUTURE EXPANSION REQUIREMENTS AND CONSTRUCTABILITY

Future expansion will be required new the 88kV control room will be built to accommodate /house new panel and the relocating feeders.

## 25. MAINTENANCE REQUIREMENTS

All secondary plant maintenance shall be carried out as per maintenance manuals that can be found using the follow link: [http://tx1.eskom.co.za/docManagement/part\\_b.htm](http://tx1.eskom.co.za/docManagement/part_b.htm) - Secondary Plant Maintenance Manual.

## 26. REFERENCE DOCUMENTS:

- 240-53249157 PTM&C Operating Procedure
- 474-313 Secondary Plant Technology Development Procedure
- 41-714 Process for Secondary Plant Technology Management
- 41-1022 Design Construct and Refurbish Process guide
- 240-44509564 Basic PCM – Perform Design Analysis
- 240-53458797 PCM for PTMC
- 474-314 Transmission PMC Application Guideline
- 474-315 PTM&C Project File Guideline
- South African Grid Code (Network code ver. 8)
- SPL46-101 Protection Settings Philosophy for Transmission and Sub – Transmission Grids
- TST41-1062 Standard for Electronic Protection and Fault Monitoring Equipment
- Standard for the Protection and Control of Transmission Transformers & Shunt Reactors on the Eskom Power System TST41-765
- South African Grid Code (metering code ver 8)
- NRS057:2009 Code of Practice for Electricity Metering
- Standard Minimum Requirements for the Metering of Electrical Energy & Demand DST34-1024
- Goods Information for Standard Meter Scheme TSP41-697
- Standard for Non-Lethal Energized Perimeter Detection System (NLEPDS) structure and associated equipment for the protection of Eskom Installations and its Subsidiaries 32-402

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- Robust Energizer TSP41-766
- Secondary Plant Templates for Planned Maintenance 41-976
- Secondary Plant Maintenance of Transformer Bays TPC41-530
- Transmission Maintenance Planning, Scheduling and Control TST41-475
- Feeder Protection Maintenance TPC41-444
- Protection Maintenance of Bus Coupler and Bus section TPC41-146
- Secondary Plant Maintenance of Low Impedance Bus Zone TPC41-565
- Test, Maintenance & Fault Finding requirements for Recording Equipment TPC41-470
- Digital Fault Recorder Setting Philosophy TGL002
- Secondary Plant Maintenance of Simeas R Disturbance Recorder TPC41-760
- Measurements Equipment Maintenance TPC41-527
- Metering Equipment Maintenance TPC41-528
- Secondary Plant Security Systems Maintenance Procedure TPC41-245
- Secondary Plant Refurbishment Procedure TPC41-780
- Commissioning of Transformers and Reactor Bays TPC41-78
- Commissioning of Transformers and Reactor Bays TPC41-140
- Secondary Plant Commissioning of EHV or HV Feeder Bay TPC41-180
- Secondary Plant Commissioning of Bus coupler & Bus Section TPC41-149
- Commissioning of Metering Installations TPC41-561
- Secondary Plant Security Systems Commissioning Procedure TPC41-244
- Substation Fibre Optic Cable Installations TPC41-115
- Fibre Optic Cable System Acceptance Testing TPC41-5

## 27. REVISION TRACKING

Rev No	Description	Compiler	Date
1	Initial Project Scope	C. Mohloki	17 March 2023

## 28. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- PTM&C Project Engineering Team

## 29. ACKNOWLEDGEMENTS

- None.

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### **30. APPENDIX**

#### **30.1 APPENDIX A – PDE DRT PRESENTATION SLIDES/EQUIPMENT LIST**

#### **30.2 APPENDIX B – CONTROL ROOM SIZING (IF REQUIRED)**

#### **30.3 APPENDIX C – DC SYSTEMS SIZING (IF REQUIRED)**

#### **30.4 APPENDIX D – SECONDARY PLANT SOW DOCUMENT**

#### **30.5 APPENDIX E – CABLE CODUMENT**