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Foreword

This document presents the Scope of Work for UMKOMAAS 88/22/11 KV SUBSTATION DIRECT CUSTOMER – STRENGTHENING PROJECT. This project is a strengthening project that will involve the Control Plant and Primary Plant equipment at Umkomaas SS and has been sanctioned by Area Team Members (PMB), and Control Plant Stakeholders.

Revision History

Date	Rev.	Clause	Remarks
03/2021	0	N/A	Compiled By: H. Ahmed

1 Scope

AT UMKOMAAS SS

DECOMMISSION:

- 22 kV NETWK BKR 61 RURAL PROTECTION SCHEME
- 22 kV NETWK BKR 62 RURAL PROTECTION SCHEME
- 22/11 kV TRANSFORMER 21 PROTECTION SCHEME & PANEL
- METERING UNITS & METER MODULE PLATES
- 110 V DC BATTERY BANK
- AC DISTRIBUTION BOARD
- 22 kV VAMP BB PROTECTION FROM EXISTING 22 KV SWITCHGEAR AND 22 KV FEEDER SCHEMES

COMMISSION

- NEW 4CF3100 MV PROTECTION SCHEME FOR 22kV NETWK BKR 61 ON-BOARD OF SWITCHGEAR
- NEW 4CF3100 MV PROTECTION SCHEME FOR 22 kV NETWK BKR 62 ON-BOARD OF SWITCHGEAR
- NEW 4CF3100 MV PROTECTION SCHEME FOR 22kV NETWK BKR 228 ON-BOARD OF SWITCHGEAR
- NEW 4CF3100 MV PROTECTION SCHEME FOR 22kV FUTURE PANEL ON-BOARD OF SWITCHGEAR
- NEW 4CF3100 MV PROTECTION SCHEME FOR 22kV TRFR MV BKR ON-BOARD OF SWITCHGEAR

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- NEW 4TM7101 / 4TC5200 TRANSFORMER / TC SCHEME FOR 88/22kV TRANSFORMER 01 ON A SEPARATE SWING FRAME PANEL.
- NEW 4TM7101/4TC5200 TRANSFORMER / TC SCHEME FOR 22/11kV TRANSFORMER 21 ON A SEPARATE SWING FRAME PANEL.
- EXISTING 11 kV VAMP BB PROTECTION TO NEW CONTROL PLANT EQUIPMENT
- NEW METERING UNITS ON EXISTING SWING FRAME PANEL & NEW SWING FRAME PANEL
- NEW 110 V BATTERY BANK
- NEW AC DISTRIBUTION BOARD AND CHANGE-OVER

Constructability Plan

An RMU is to be used to bypass the 22kV Indoor Board. Hence all new control plant may be commissioned without further outages except to swing back the MV cables.

Notes

1. All panels are to be installed as per the Control Panel Layout Drawing and all cabling is to be completed based on the cable block drawing relevant to that equipment.
2. Old cabling that is not being used must be removed and scrapped.
3. Protection relays / components are to be offered to John Fuchs prior scrapping, thus he must be informed prior.

It should be noted that the Protection commissioning process includes but not limited to the following tests:

1. Panel Tests , Visual inspection and ringing of all control plant cables
2. Secondary Tests
3. Primary Test
4. Review and submission of documentation
5. Project sign off and hand over for commercial operation

To ensure that the commissioning and installation of control plant equipment is done as per Eskom standard all commissioning test documents are submitted, the ***Quality Control Process for the checking of Distribution Substation Construction Before Hand Over for commercial Operation*** (Annex G) must be completed and sign off by relevant stake holders

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2 Protection

2.1 Feeder Protection

2.1.1 22kV Feeder Protection

The existing 22 kV housing 3RF3RAD schemes utilising the REF544(DPU 2000R) relay will be decommissioned and removed from site.

New 22 kV fixed pattern switchgear will be installed and commissioned. Due to procurement and contract issues, the new 22 kV Switchgear for the Umkomaas SS Project is still not confirmed and is to be ordered. The feeder schemes are to be delivered pre-installed in the switchgear by the switchgear manufacturer. This will include the arc sensors in the relevant chamber connected to the scheme and termination of the control cables between the scheme and breaker terminals. It is the responsibility of the commissioning team to check each connection point for each bay prior to commissioning.

When the schemes are being commissioned, it is essential that the inter scheme loops are checked, including but not limited to:

1. AC Supply
2. DC Supply
3. DNP3 connections
4. GOOSE messaging connections
5. PNH connections
6. Spring rewind DC supply

Settings are to be applied for each bay and tested accordingly. Likewise each arc sensor must be tested and confirm that the tripping philosophy that is relevant for that sensor location is prevalent. For example an activated sensor (with current starter) in the cable crutch chamber will result in only that bay tripping whereas a sensor in the BB/breaker chamber will cause the entire BB to be stripped.

2.1.2 11 kV Feeder Protection

The existing 11 kV Board and 11 kV Feeder Protection will continue to be used. No significant changes will take place affecting the 11 kV Feeder Protection and 11 kV Switchboard.

2.2. Transformer Protection

2.2.1 20 MVA YNd1 88/22 kV Transformer 01

A new 4TM7101 Transformer Scheme & 4TC5200 Tap-Changer Scheme will be used for the protection of the new 88/22 kV Transformer 01. A separate swing frame panel will house the transformer scheme.

2.2.2 10 MVA YNyn0 22/11KV Transformer 21

The existing Protection Scheme (See figure 04 below) will be decommissioned and removed from site.

A new 4TM7101 Transformer Scheme & 4TC5200 Tap-Changer Scheme will replace the existing protection of the 22/11 kV Transformer 21. A separate swing frame panel will house the transformer scheme. See figure 12 for Control Room Layout for the Transformer 21 Protection Scheme.

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The scope of work for the commissioning of the new / existing Transformer and Tap-change scheme would be as follows:

- Install Transformer junction boxes (TJB) and run new cables from TRFR/TC, NEC/RT marshalling kiosks to TJB.
- Install AC changeover and connect axillary supplies from each NEC/RT. The AC Changeover output must be connected to the new AC DB.
- Run and terminate new control plant cables from TJB to TRFR/TC protection schemes panel.
- Run and terminate new control plant cables from VT JB to TRFR control panel.
- Run and terminate new control plant cables from TRFR primary CT JB to TRFR control panel.
- Run and terminate new control plant cables from primary and secondary TRFR breakers / mechanism box to TRFR control panels
- Commission the Transformer and Tap changer schemes(4TM7101 and 4TC5200)
- All cable will laid out as per cable route diagram and cable block diagram that will be issued as part of this project package
- All TI's/TB's are to be applied for 4TM7101/4TC5200 schemes that are applicable.

2.3. BUS-BAR PROTECTION SCHEME

2.3.1 22 kV VAMP BB Protection

The existing 22kV VAMP scheme is to be decommissioned. Spare relays, trip repeats and arc sensors from the old board are to be issued to John Fuchs. Alternatively if he deems it more appropriate, the scheme must be kept intact to be used in another location.

BB Arc protection is achieved via the inter-scheme communication that is inherent in the new feeder schemes. The supplier (ABB) is expected to pre-load the software and tripping logic to achieve BB protection. Every sensor must be tested to confirm correct operation on site.

2.3.2 11 kV VAMP BB Protection

The existing 11kV VAMP BB Protection Scheme will continue to be used for the protection of the existing 11 kV Switchgear (the 11 kV Switchgear will remain unchanged). The 11 kV VAMP Bus-Bar Protection Scheme will be commissioned to the new Control Plant Equipment viz new 22/11 kV Transformer Scheme, new AC DB etc.

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3 Statistical Metering

Due to the age of the metering and non-standard module plates, new metering units and module plates will be installed to replace the current metering units. The existing Swing Frame Panel and Modem will continue to be used for the Statistical Metering Panel 01.

A second metering panel will be introduced, Statistical Metering Panel 02, to cater for the new 22kV Bays. A new modem will be installed for Metering Panel 02.

The meter module plates and meters for the 2 panels will be positioned in each panel as per the Metering Drawings.

Metering Panel 01 will consist of three meter module plates and five meters while Metering Panel 02 will consist of two meter module plates and four meters.

4 DC and AC Supply

4.1 DC SUPPLY

The existing 110 V Battery Bank (Nicad, ALCAD, L60P), will be decommissioned. A new 110 V VTXM100 Battery Bank and Cabinet will be installed and commissioned in the Control Room.

The existing 110 V Battery Charger (Cordex 110 V 20 A) is still adequate for the Control Plant usage and is to be retained. The new battery bank is to be commissioned and the settings on the existing charger are to be confirmed for the new battery bank. New cables are to be installed if the existing cables between the charger and battery cabinet are short. Furthermore, the battery monitoring cable to enable the theft alarm on the charger, is to be installed and commissioned as per the Engineering Instruction (240-141330136).

4.2 DC DB

Five additional DC MCB's are to be installed as per the DC DB drawing. Due care must be applied when installing the MCB's as the DB will be live. Bypass methods to allow the DB to be worked on under a de-energised state is to be applied. The DC DB will be appropriately labelled for the new the new circuit connections.

4.3 AC SUPPLY

The existing AC DB will be de-commissioned and removed from site. A new 3 tier AC DB will be commissioned into service.

A new AC distribution board (AC DB) is to be installed on the wall as indicated by figure 12. The new AC DB will be supplied from the new AC Changeover to be installed. The AC Changeover will be fed from Transformer 12 NEC auxiliary supply and Transformer 01 NEC auxiliary supply via a 4 core 16mm² cable. The load circuits of the new AC DB will be labelled and commissioned appropriately. The decommissioned

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plant is to have the supply cable removed from the switch room trench. Upon removal of the existing AC DB the new AC DB is to be installed,

The new changeover will be mounted on the outside of Umkomaas SS Control Room wall.

A Certificate of Compliancy (COC) will be done for the AC and DC DB once commissioning at the sub-station has been completed.

5 Telecontrol

The existing D20 RTU will be retained at Umkomaas SS. No additional I/O cards will be required. An additional Moxa Converter Tray and two Moxa convertors will have to be installed in the RTU.

All new schemes will communicate serially with the RTU via the Moxa convertors. The drawings must be followed for the connections between schemes.

An updated telecontrol excel spreadsheet is to be uploaded in the D20 RTU. (This uploaded spreadsheet will cater for all newly refurbished control plant equipment).

All respective control equipment will be commissioned to the D20 RTU as per outage and commissioning plan of the control plant equipment.

The Eskom approved contractor or CPM will be responsible for the commissioning of the D20 RTU to the newly commissioned equipment.

The telecontrol records are to be issued to SCADA for updating the Master Station. Adequate time (min. 2 weeks) must be provided for this purpose.

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6 Panel layout

The control panel layout drawing must be adhered to, indicated below for convenience, however the official drawing must be used for possible revisions.

