PROJECT NO:	**2401**
PROJECT:	**TRANSFORMER LOADING**
LOCATION:	**SPRINGS, EASTERN BASIN**
CLIENT:	**TCTA**
DOCUMENT DESCRIPTION:	**SCOPE OF WORKS**
DOCUMENT NO:	**2401-0000-J03-0001.00-00**

REV	DATE	DESCRIPTION	E&I	ENG MANAGER	MAINTENANCE MANAGER	MAINTENANCE MANAGER
00	05/08/2024	APPROVED FOR USE		SDE		MAS
P3	19/06/2024	INTERNAL REVIEW		SDE		MAS
P2	04/06/2024	INTERNAL REVIEW		SDE		MAS
P1	21/05/2024	INTERNAL REVIEW		SDE		MAS

ALL REVISIONS WILL BE INDICATED BY GREY HIGHLIGHTING IN THE DOCUMENT BODY

REVISION RECORD SHEET

REV NO	DESCRIPTION OF REVISION	REV DATE
P1	INTERNAL REVIEW	21/05/2024
P2	IDC	04/06/2024
P3	INTERNAL REVIEW	19/06/2024
00	BATTERY LIMITS UPDATED	05/08/2024

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1 LIST OF ABBREVIATIONS AND ACRONYMS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
C&I	Control and Instrumentation
DFT	Dry Film Thickness
ISO	International Organization for Standardization
MCC	Motor Control Centre
OHS	Occupational Health and Safety
PLC	Programmable Logic Controller
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
SANS	South African National Standards
SCADA	Supervisory Control and Data Acquisition
SI	International System of Units
TBA	To Be Advised
UOS	Unless Otherwise Stated

2 INTRODUCTION

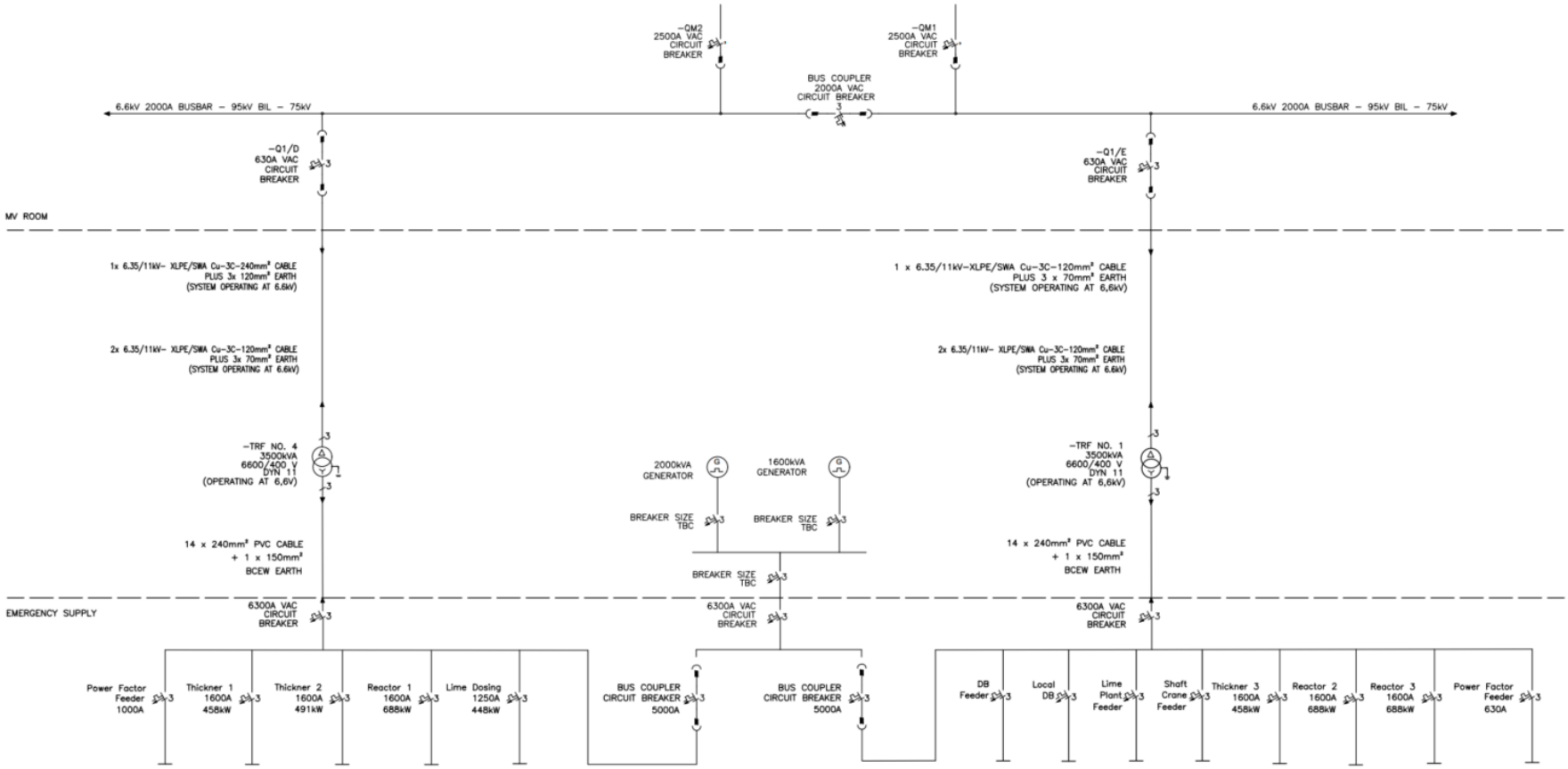
The TCTA Eastern Basin Water Treatment Plant currently neutralises feed water as abstracted from the defunct underground workings. The current infrastructure, illustrated in figure 1, of the plant includes three transformers, all fed from Eskom's 6.6kV line, which is linked to the existing MV (Medium Voltage) board. These transformers serve the crucial function of stepping down the voltage to 400V for operational purposes. Transformers 1, 2, and 3 are rated at 3500kVA, 2000kVA, and 2000kVA, respectively.

Of note, Transformer 1 operates in parallel with two generators, one rated at 1600kVA and the other at 2000kVA. This parallel configuration ensures redundancy and reliability in power supply, especially for critical equipment within the plant. The generators are integral components in maintaining uninterrupted power flow to essential operations, providing a backup in case of any unforeseen power disruptions.

Nafasi Water's Engineering team has been approached to provide the engineering and preliminary design services, as defined below, associated with the proposed installation of a fourth (4) transformer, taking into consideration the required modification to the existing MV switchgear. This is to accommodate the new transformer (4) and interfacing it with the existing LV MCC 1 and Genset and balancing the loading between transformer 1 and 4 at Low Voltage MCC 1.

This service would entail the review of the plant existing electrical design information (to be provided by TCTA), audit the available information and then scope the works, define the project and interface requirements associated with the transformer (4) installation. Once Scope of works have been approved (Nafasi/TCTA) Nafasi's engineering team will formally issue request for quotation (RFQ) via the Nafasi procurement procedure, on behalf of TCTA to the market, thereafter, adjudicate the respective tenders and provide TCTA with a technical recommendation.

Figure 1: Transformer Balancing Single Line Diagram



3 REFERENCE DOCUMENTS

3.1 Request for Quotation

- 2401-0000-B70-0001.00

3.2 Single Line Diagrams

- Gen Single Line Diagrams: TEC-DWG-ELE-R00
- Overall MV/LV Distribution: TEC-DWG-ELE-0443-R00
- Transformer Loading: 2401-0000-J34-0001-00

3.3 Generator Control Schematic

- Generator Details: TEC-DWG-ELE-0430-R0

3.4 Feeder Drawings

- LV Feeder 1: TEC-DWG-ELE-0441-R00
- LV Feeder 2 & 3: TEC-DWG-ELE-0443-R00

3.5 Network Layout

- Network Layout: TEC-DWG-ELE-0462-R01

4 SCOPE OF WORK

4.1 Drawing/design for New Low Voltage (LV) Distribution Board (DB)

This design activity will entail the sourcing of preliminary vendor drawings from recommended manufacturers and current certified designs from the TCTA, for Transformer one (1), Transformer two (2), Transformer three (3), four (4), and Gensets. As required for the design of the new Low Voltage Distribution board (DB) including redlining all the drawings to ensure accuracy and completeness to as built as currently installed on site.

4.2 Audit Existing Low Voltage (LV) Distribution Box Installation

This design activity will entail an audit of the existing Low Voltage DB to verify the current installation of all components in the Low Voltage Distribution Box for all Transformers and Gensets and allocation of equipment to each transformer feeder.

Provide the specification required to define the power load balancing on Transformer one (1) and Transformer two (4).

4.3 Power Factor Correction

This design activity will entail defining the scope for implementing power factor correction and incorporate the recommendation from the Root Cause Analysis (RCA) associated with the recent panel incident to incorporate learning into the new LV Fedder MCC 1 panel design.

4.4 Medium Voltage (MV) Circuit Breaker for Transformer 4

This activity will identify and define the scope of the MV Circuit Breaker required for Transformer 4 including extension of busbars.

4.5 Interface with Eskom and Existing MV Panel

This activity will establish and define the interface between Eskom and the new and existing MV panels respectively and defining the integration methodology for compatibility between the systems.

4.6 Cable Lengths for MV Panel to Transformer 4 and Genset to LV Panel

Determine and quantify the required cable sizing and lengths for the connection between the MV panel and Transformer 4 secondary cables to main Incomer 2 also including both LV and MV cable terminations This activity will include moving Transformer 1 secondary side cables from the changeover panel breaker to the main incomer No. 1 bucket. Swapping of Thickener 3 cables with Reactor 1 cables at LV Feeder MCC 1 including extensions and joining of thickener 3 cables reach Reactor 3 cubicle. A termination schedule and define any racking requirements to support the cables.

4.7 Civil Work Scope at MV Room and Trenching

Define the scope of civil works required at the MV room, including trenching, installation of cable sleeves, core drilling for cables and construction of the new transformer bay including its plinth

and extension of palisades whilst ensuring compliance with safety and regulatory standards during the civil work and the position of the transformer.

5 BATTERY LIMITS

5.1 New MV panel

5.2 MCC 1 Feeder and MCC 2 Feeder

6 SCOPE OF SERVICE

6.1 Design

- Design of the Transformers distribution.

6.2 Procurement

6.2.1 Procurement as per specifications, purchase orders and expediting.

6.2.2 Site delivery of all equipment and materials

6.2.3 Site SHEQ compliance and management

6.2.4 Supply of equipment documentation

- Delivery notes
- Detailed packing list

6.3 Supply

6.3.1 Supply and Relocation of feeder cables if needed according to audit of Low Voltage (LV) Distribution Box recommendations.

6.3.2 Supply and Installation with an auxiliary equipment of Power Factor Correction (PFC).

6.3.3 Supply and Install Medium Voltage Circuit breaker for Transformer 4.

6.3.4 Supply and Relocation of feeder cables if needed according to audit of Transformer 4 to Low Voltage (LV) Panel recommendations.

6.3.5 Supply all civil works required and rigging study for the project.

6.3.6 Supply of all materials, labour, equipment, tools, consumables, and facilities for fabrication of the equipment that are not free issued where applicable.

6.3.7 Supply of all materials, resources, and equipment, including specialised equipment required for the transportation of the equipment where applicable.

6.3.8 Supply of all materials, resources, and equipment, including specialised equipment and facilities required for a proper and safe site establishment in preparation of all construction activities.

6.3.9 Supply of all projects, quality, and engineering documents as applicable to the scope.

6.3.10 Supply of all materials, labour, equipment, tools, consumables, specialised equipment required for the construction as listed.

6.4 Commissioning

6.4.1 Commissioning of new MV for Transformer 4.

6.4.2 Commissioning of LV Distribution Box

6.4.3 Commissioning of Power factor correction.

6.4.4 Commissioning of all Transformers.

6.4.5 Commissioning, supervision, and support during system commissioning.

6.5 Engineering Document/ Deliverables

- Electrical Design
- Basis of Design
- Method Statement
- Project Schedule
- Functional description
- Scope of Work
- Detailed Bill of Quantities
- Equipment Datasheets
- GA Drawings
- Single line diagrams
- Block drawings.
- Cable & Termination Schedules
- Commissioning of complete project

- QA/QC Documentation
- Electrical Certificate of Compliance
- Project Databook with approved Index.