Eskom	Scope of Work	Tutuka Power Station

Title: **Scope of Work for the Design of Fire Protection Pumping System at Tutuka Power Station**

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1. Introduction

The design baseline fire system originally installed for the power station, i.e.,100% supply from 2x electrical pumps and 100% supply from 2x diesel pumps, was designed and built to support the generator transformer fire protection system with manual firefighting intervention, which at the time was defined as the worst-case fire scenario.

After the installation of the turbine underfloor fire protection system the worst-case fire scenario water demand of the power station increased, but the fire pumps were never upgraded to support the increase. This situation poses a risk of damage to property and personnel injury/death in the event of uncontrollable fire at turbine underfloor area.

To address this problem, chosen concept design option shall meet worst-case fire demand of 18,876.85l/m @991.66kPa. It shall consist of two main electrical driven pumps and two diesel back-up pumps with similar capacity. Two new electrical driven jockey pumps to maintain minor pressure losses will be installed to preserve the main pumps from running all the time resulting in premature wearing of components. The main pump types should be of centrifugal horizontal split casing type. The supply to the pumps will still be from the existing portable and raw water tanks.

The pumps layout will remain the same, they will still be getting suction from the same manifold and discharging to the same manifold. From the discharge manifold, fire water will still be distributed via the 3 x main ring piping (Outside Plant, Turbine and Boiler).

2. Supporting Clauses

2.2.1 Scope

Upgrade of Tutuka Power Station Fire Protection System Pumps to meet worse-case scenario fire water demand of 18,876.85l/m @991.66kPa.

2.2.2 Purpose

Upgrade of Fire Protection Pumping System at Tutuka Power Station.

2.2.2 Applicability

This document is applicable to Tutuka Power Station.

2.2.2 Effective date

This document will be effective from the date of its authorisation.

2.2.1 Normative/Informative References

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

2.2.2 Normative

[1] ISO 9001 Quality Management Systems

2.2.2 Informative

[2] 15GEN ENG-751 Tutuka Worst Case Fire Scenario.

[3] 21.61/55404 Fire Control Pump House System P&ID

[4] NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection

[5] SANS / ASIB

2.2.1 Definitions

Definition	**Explanation**
Contractor	Service provider contracted to provide a specific spares & documentation to Tutuka Power Station. Referred to as the Supplier on this document.
Employer	Tutuka Power Station
Worst-case scenario	Any fixed fire suppression system/s demands that could reasonably be expected to operate simultaneously during a single fire event.
Disclosure Classification	Controlled Disclosure to external parties (either enforced by law, or discretionary).
I/O list	It is a document that comprises a list of the Input and Output utilized in a control system.

2.2.1 Abbreviations

Abbreviation	Description
ASIB	Automatic Sprinkler Inspection Bureau
BMS	Building Monitoring System
CCCC	Central Change Control Committee
DOL	Direct – On - Line
KPA	Kilopascals
NFPA	National Fire Protection Association
MCC	Motor Control Centre
VFD	Variable Frequency Drive
PLC	Programmable Logic Controller
QCP	Quality Control Plan
SANS	South African National Standard
SCADA	Supervisory Control and Data Acquisition

2.2.1 Roles and Responsibilities

2.2.2 Contractor

a) To Assess the existing Fire Protection Pumping System, Design an Upgraded Pumping System that meets worse-case scenario, Deliver code and Standard code compliant designs to Tutuka Power.

b) Contractor shall submit all documentation and approvals as requested by the Employer.

2.2.2 Employer

a) Compiles and submits scope of work with technical specifications.

b) Reviews and approves drawings during the design process and accepts the final drawings/designs on delivery at the Employer premises.

2.2.1 Process for Monitoring

- All designs will be reviewed as per Eskom Design Review Procedure (240-53113685 [5].
- All designs to be reviewed and accepted by CCCC.
- Installation will be monitored through approved quality control plans (QCP) to ensure industry standards are adhered to (i.e., NFPA), executed according to the agreed scope of work and executed according to the approved designs.

2.2.1 Related/Supporting Documents

As per **2.2.2**

3. Scope

This scope involves upgrading the fire protection system pump to enhance reliability, compliance with local codes, and ensure worse-case scenario is met. The scope includes assessment, design and delivery of NFPA or SANS/ASIB compliant new pumping system design to Tutuka Power Station.

4. Description of the works

The works is to assess the existing fire pumping system, design an upgraded system that meets worse-case scenario of **18,876.85l/m @991.66kPa** and deliver approved designs to Tutuka Power Station.

4.1 Assessment and Pre-design Phase

4.1.1 Site Survey & Data Collection

- Evaluate the existing fire pump system, piping, valves, and electrical infrastructure.
- Review applicable fire codes and standards (NFPA 20, NFPA 25, SANS/ASIB).
- Perform hydraulic calculations to determine required pump capacity and pressure.

4.1.2 System Analysis & Feasibility Study

- Assess water supply adequacy.

- Identify required upgrades to meet performance standards.
- Review structural and space constraints for new equipment.

4.2 Mechanical Scope of work

4.2.1 Fire Pumps & Accessories:

- Selection of electric/diesel-driven fire pumps based on required flow and pressure.
- Design of jockey pumps for pressure maintenance.
- Development of pump arrangement layouts with space for maintenance access.
- Pump baseplate and anchoring design to handle operational loads and vibrations.

4.2.2 Piping and Hydraulics:

- Hydraulic analysis and pipe sizing calculations (flow, pressure loss, friction).
- Design of fire main piping network (hydrants, deluge, sprinklers).
- Selection of pipe materials.
- Pipe routing, support, and expansion allowance designs.
- Valve selection (deluge valves, pressure relief, non-return valves).

4.2.3 Water Storage and Supply:

- Assessment of existing water tanks/reservoirs; design for additional capacity if needed.
- Design of pump suction arrangements to prevent cavitation.
- Refill rate calculations and makeup water supply design.

4.2.4 Fire suppression System Interface:

- Coordination with fire hydrants, sprinklers, and deluge systems.
- Interface design with fire detection and alarm systems.

4.3 Electrical Scope of work

4.3.1 Power Supply & Distribution:

- Load analysis for bigger fire pumps.
- Cable sizing and power distribution system design.
- MCC (Motor Control Centre) modifications or new panel design.
- Backup power provisions.

4.3.2 Motor Control & Protection:

- Pump motor starter selection (DOL, soft starter, VFD).
- Design of motor protection systems (overload, short-circuit, thermal).
- Earthing & bonding design per SANS 10142-1.

4.3.3 Emergency & safety Features:

- Redundant power sources and transfer switch design.
- Emergency stop circuits and manual bypass design.

4.4 Control & Instrumentation Scope of Work

4.4.1 Fire Pump Control System

- Specification of fire pump controllers per NFPA 20.
- PLC-based control philosophy development.

4.4.2 SCADA & Automation Integration

- Monitoring & control interface with SCADA/BMS.
- Remote alarm signaling for fire pump failure, low pressure, low water level.
- Communication protocol selection (Modbus, Profibus, Ethernet).

4.4.3 Instrument Design

- Flow meters, pressure transmitters, level sensors, and temperature sensors.
- Control panel design with HMI for local pump monitoring.
- Integration with fire detection and alarm systems.

4.5 Civil & Structural Scope

4.5.1 Pump Room & Equipment Foundation:

- Drainage & Environmental Considerations:
- Design of drainage sumps for potential pump leaks or test water discharge.
- Floor grading and waterproofing improvements.
- Fire-resistant coatings or enclosures if required.

4.5.2 Pipe Routing and Support Structures:

- Structural supports for new piping runs and elevated fire mains.

- Seismic load analysis.

4.5.3 Water storage Upgrades:

- Civil modifications for additional water inlet/outlet arrangements.

5. Engineering Deliverables:

5.1 Mechanical:

- Fire pump and piping P&ID diagrams.
- Hydraulic analysis report.
- Fire water network isometric drawings.
- Pump foundation layout & anchoring details.

5.2 Electrical:

- Single-line diagrams (SLDs) for power distribution.
- MCC circuit diagrams and panel layouts.
- Cable routing drawings & schedules.
- Load flow and voltage drop analysis reports.

5.3 Control & Instrumentation:

- Control philosophy & functional design specification.
- PLC & SCADA architecture diagrams.
- Instrument loop diagrams and I/O lists.

5.4 Civil & Structural

- Structural load assessment report.
- Pump house modification drawings.
- Pipe support structural layouts.
- Drainage & sump pit design details.

6. Bill of Material & Quantities

List of all equipment, specifications, quantities and selection report.

7. Planned KEY PERFORMANCE INDICATORS (KPI)

The KPI's will be used to determine the successful performance of the scope. The Supplier is required to perform and meet these targets. The KPI's are to be agreed to between parties and are subject to change on as and when required basis.

- Fire Protection System Compliance & Regulatory Requirements.
- Fire Pump System Design Requirements
- System Redundancy & Reliability factored in the design
- Water Supply & Storage requirements
- System Integration & Monitoring requirements
- All required design reviews and approvals completed.
- First committed delivery date

8. Acceptance

This document has been seen and accepted by:

Name	Designation
K Gcwabe	System Engineer

9. Revisions

Date	Rev.	Compiler	Remarks
April 2025	1	K Gcwabe	New Document

10. Development Team

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

K Gcwabe

11. Acknowledgements

N/A