	<b>Scope of Work</b>	<b>Kusile Power Station</b>
-----------------------------------------------------------------------------------	----------------------	-----------------------------

Title: **Scope of Work: Chimneys (West and East) Repairs During Outage at Kusile Power Station**

Document Identifier: **KUS-20220812**

Alternative Reference Number: **N/A**

Area of Applicability: **Kusile Power Station**

Functional Area: **Outage Management**

Revision: **2**

Total Pages: **14**

Next Review Date: **November 2025**

Disclosure Classification: **Controlled Disclosure**

---

**File name:** KUS-20220812 Kusile Power Station Scope of Work Chimneys (West and Est) Civil Inspection and Repairs During Outage

<b>Content</b>	<b>Page</b>
1. Introduction .....	4
2. Supporting Clauses.....	4
2.1 Scope .....	4
2.1.1 Purpose .....	4
2.1.2 Applicability .....	4
2.1.3 Effective date .....	4
2.2 Normative/Informative References .....	4
2.2.1 Normative .....	4
2.2.2 Informative .....	5
2.3 Definitions.....	5
2.4 Abbreviations .....	5
2.5 Roles and Responsibilities .....	6
2.5.1 Employer .....	6
2.5.2 Contractor .....	7
2.5.3 Management and Reporting.....	8
2.5.4 Contractor's Management, Meetings and Key People.....	8
2.5.5 Communication and Correspondence .....	8
2.5.6 Quality and Documentation Control.....	9
2.5.7 Project Implementation .....	9
2.5.8 Manpower Requirements .....	9
2.6 Process for Monitoring .....	10
2.7 Related/Supporting Documents .....	10
3. Chimney Outage Scope of Work .....	10
3.1 Background .....	10
3.1.1 Horizontal Flue Inlet .....	10
3.1.2 Stainless Steel Vertical Flue.....	10
3.1.3 Flue Internal Lining .....	11
3.2 Outage Philosophy .....	11
3.3 Scope Details .....	13
3.3.1 Constraints on how the Contractor Provides the Works.....	13
3.4 Exclusions .....	13
4. Acceptance .....	13
5. Revisions .....	13
6. Development Team.....	14
7. Acknowledgements .....	14

## **Figures**

Figure 1: Outage Philosophy .....	11
-----------------------------------	----

## **Tables**

**CONTROLLED DISCLOSURE**

---

Table 1: Outage philosophy breakdwon.....	12
-------------------------------------------	----

## **1. Introduction**

The corrosive environment in the chimney flue duct necessitates an internal and external structural assessment to be conducted on a periodic basis, to render the structure safe for continued use. The outage related scope of the smoke stacks (also known as chimneys) will be outsourced to a suitably qualified, experienced and well established Contractor. This document describes the detail of the scope of work, standards, quality requirements, specifications, terms & conditions as well as the criteria to qualify for the tender.

## **2. Supporting Clauses**

### **2.1 Scope**

#### **2.1.1 Purpose**

The purpose of this document is to define the specified scope of work activity requirements for the Station's chimney infrastructure. The Station is expected to perform at 92% Unit Capability Factor (UCF), 6% Planned Capability Loss Factor (PCLF) and 2% Unplanned Capability Loss Factor (UCLF), and the chimneys' outage activities and maintenance strategy must support this requirement. It is therefore imperative that the successful Contractor aligns their organisation to these specified scope activities and processes laid down in this document. The intention is to optimise the service life of the infrastructure and allow for refurbishment or replacement activities before failure of components.

#### **2.1.2 Applicability**

This document applies to Kusile Power Station only.

#### **2.1.3 Effective date**

Document is effective upon authorisation.

### **2.2 Normative/Informative References**

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

#### **2.2.1 Normative**

- [1] ISO 9001 Quality Management Systems
- [2] OHS ACT Occupational Health and Safety Act, 85 of 1993
- [3] 240-81951984 Kusile Outage Philosophy
- [4] 240-99527377 Inspection Manual for Civil Works at Eskom's Power Stations

**CONTROLLED DISCLOSURE**

## 2.2.2 Informative

[5] 237-0016 Rev 0: Integrated Business improvement – Prevention and Improvement Standard

[6] GGR 0992: Plant Safety Regulations

[7] Outage Philosophy Document - 240-49346331

[8] Outage Philosophy Standard - 240-47531738

## 2.3 Definitions

Definitions	Explanations
<b>Client</b>	The owner of the Power Station. Normally the Power Station or Plant Engineer will represent the Client
<b>Contractor</b>	Service provider contracted for supplying specific service to Eskom, Kusile Power Station.
<b>Employer</b>	Eskom, Kusile Power Station
<b>Employer Representative</b>	Any person appointed in writing by Employer as the delegated Employer representative in terms of the provisions.
<b>Flue ducts</b>	The ducts are circular or rectangular steel ducts and convey the flue gasses from the gas cleaning plant through to the chimneys. The ducts have thermal insulation on the outside. The thermal insulation is protected against the weather by cladding.
<b>Outages</b>	Outage is a planned period of time where the machine is unable to perform its functions.
<b>Plant</b>	Any structure, machinery, apparatus or equipment which does not fall within the scope of the operating regulations for high voltage systems, and excludes, mobile, portable lifting equipment, domestic circuits' appliances and tools.
<b>Plant Engineer</b>	A person designated by the Client as having engineering responsibility for a specific plant
<b>Subcontractor</b>	An individual or business which has a contract with a contractor to provide some portion of the work or services on a project which the contractor has agreed to perform

## 2.4 Abbreviations

Abbreviation	Explanation
FGD	Flue Gas Desulphurisation
FFFR	Fossil Fuel Firing Regulation
FMA	Failure Mode Analysis

### CONTROLLED DISCLOSURE

Abbreviation	Explanation
GI	Guarantee Inspection
GO	General Overhaul
MGO	Mini General Overhaul
NDT	Non-Destructive Testing
OHS	Occupational Health and Safety
PCLF	Planned Capability Loss Factor
PSR	Plant Safety Regulations
SOW	Scope of Work
UCF	Unit Capacity Factor
UCLF	Unit Capability Loss Factor
URS	User Requirements Specification
NDT	Non-Destructive Testing
OHS	Occupational Health and Safety

## **2.5 Roles and Responsibilities**

### **2.5.1 Employer**

The Employer shall ensure the following:

- a) Inform and issue the Contractor with the updated outage plan
- b) Ensure the scope of work (SOW) is issued to the Contractor in time to allow for planning for the Outage
- c) Performance is measured by the Employer against those areas which contribute to the Employer's business and the Contractor shall be compensated accordingly as per the agreed contract clauses. (e.g. reliability, availability, and safety).
- d) Areas of measurement include the Employer's key business indicators and will be redefined from time to time.
- e) Employer shall provide training for plant safety regulations (PSR), fossil fuel firing regulation (FFFR) and any other training as deemed necessary by the Employer in line with the scope requirements.
- f) The Employer and Contractor in this SOW is committed towards the following:
  - i. Retention of critical skills
  - ii. Continuous cost reduction
  - iii. Health and environment safety
  - iv. Transfer of operational experience and skills

### **CONTROLLED DISCLOSURE**

## **2.5.2 Contractor**

The Principal Contractor shall ensure the following:

- a) The Contractor shall comply with the Employer's Environmental, Health and Safety standards, policies, and procedures.
- b) The Contractor shall be responsible for all works as per Employer's instructions, processes, and systems.
- c) The Contractor shall ensure that all platforms, gratings, handrails and cat ladders removed by him/her are re-instated per structural standards.
- d) The Contractor is to ensure that any service rendered does not interfere with the Employer's scheduled work and should align himself with the Employer's work control management process.
- e) The Employer shall inform the Contractor as soon as possible of any changes to the main activity schedule (programme of notifications) which might affect the activity plan of the contractor.
- f) The contract entered into with the Contractor is non-exclusive and work against this contract can only be performed upon receipt of a task order.
- g) All works will be subject to anytime inspection by the Employer.
- h) The Contractor shall take cognisance of the fact that the contract start date can deviate.
- i) The Contractor shall provide resources that are required to execute this scope and any changes to the crew must be negotiated and agreed upon with the Employer.
- j) This contract is for the outage SOW that the Contractor will be required to perform within the scope boundaries of this contract.
- k) Spillage is viewed to be very important for plant housekeeping and any spillage caused as a result of the Contractor shall be cleaned by the Contractor.
- l) The Contractor must ensure that they have responsible persons (in terms of PSR) for any work performed on plant.
- m) The Contractor shall provide equipment and tools required for the works
- n) The Contractor shall assist with the recommendations and corrective actions which are identified by the Kusile Power Station Condition Monitoring Programme
- o) The Contractor shall participate in improvement programs as stipulated by the Employer.
- p) The Contractor shall produce a final report within 30 working days after the date of completion of the works or any date agreed on as per Task Order
- q) Contractor vehicles to comply with Eskom Vehicle Standards and Procedures.
- r) During Outages it is expected that the Contractor will provide on-site representation on a 24-hour basis, seven days a week if required. Shift times: 07h00 to 19h00, 19h00 to 07h00 or whichever times that will be agreed between two parties.
- s) All additional personnel and scope of work is clarified with the Employer prior to start of works.
- t) Be in a position to make use of Primavera or any other project software agreed with the Employer for project tracking and reporting purposes.

### **CONTROLLED DISCLOSURE**

- u) The Contractor will be required to comply with the Employers process control manuals (PCM) that outlines the outage processes.

### **2.5.3 Management and Reporting**

- a) The type of reports, level of detail and frequency of reporting will be mutually agreed upon by the Employer and the Contractor during the contract negotiation phase of this agreement. These may change from time to time on request by the Employer.
- b) The Contractor shall be represented at all outages related meetings which may be daily, weekly or monthly.
- c) The Contractor shall be represented at all Employer safety meetings.
- d) The Contractor shall be represented at any ad-hoc meetings that may arise in order to address any outage planning, execution, finalisation, or safety related matters.
- e) Liaison meetings shall be held with the Employer's Representative or his/her delegate on an as and when required basis to discuss any technical details, or concerns.

### **2.5.4 Contractor's Management, Meetings and Key People**

- a) Before work starts on site, an inaugural meeting is held with the Contractor and the Employer, to explain in detail all requirements of the site regulations.
- b) The Contractor is issued with a file of current site regulations on arrival. The file remains the property of the Employer and the Contractor is responsible for its maintenance and updating to include new or revised regulations as issued by the Employer.
- c) The Contractor must ensure that all personnel operating mobile equipment and vehicles are authorised, this includes but not limited to:
  - i. Forklifts
  - ii. Mobile Cranes
  - iii. Cherry Pickers
  - iv. Sky Jacks
- d) The Contractor shall be responsible for the regular inspections and daily equipment checks of mobile equipment and vehicles including record keeping while onsite.
- e) The Contractor must ensure that all personnel performing work on the plant are authorised, this includes but not limited to:
  - i. Confined space locations
  - ii. Working at heights
  - iii. Heat stress areas
  - iv. Scaffolding Compliance
  - v. Hazardous substances

### **2.5.5 Communication and Correspondence**

- a) All correspondence includes but not limited to:

**CONTROLLED DISCLOSURE**

- i. Kusile Power Station
  - ii. Employer's Contract number
  - iii. Contract description
  - iv. Contractors contact details
  - v. Date
- b) Where appropriate, the correspondence includes the Employer's reference and is delivered as a single package or as per the agreed contract terms.
- c) All communications from the Contractor are numbered sequentially with a prefix as advised by the Employer. The Employer responds in like manner. The prefix and numbering system are decided upon at the inaugural meeting.
- d) The Contractor shall communicate with the Employer by form of telephone and writing.

#### **2.5.6 Quality and Documentation Control**

- a) During the tender process a quality criteria will be defined that the Contractor must comply to.
- b) The Contractor shall compile a specific outage quality management plan for the specified SOW and the Employer's delegated person, usually the System Engineer, will approve this.
- c) The Contractor shall ensure that any witness, hold and inspection points are strictly adhered to.
- d) The Contractor to ensure that all measuring and test equipment is calibrated at all times and proof thereof must be readily available.
- e) All quality references and standards, as stipulated in this document, will be adhered to.
- f) The Contractor to comply with the Employer's quality documentation management system and processes.

#### **2.5.7 Project Implementation**

The Contractor shall supply an outage execution plan per outage including at least the following in Primavera or any other project plan acceptable to the Employer:

- a) Site establishment
- b) Activities
- c) Manpower plan (Resource loaded)
- d) Organogram
- e) Skills required and associated cost per skill (e.g., artisan, site manager, etc.)

#### **2.5.8 Manpower Requirements**

- a) The number of personnel required to execute the works is to be proposed by the Contractor after his/her assessment of the scope of work and submitted to the Employer for approval.
- b) The successful Contractor shall utilise/provide skilled and suitably qualified staff with experience in the technical aspects of this SOW and supporting teams.
- c) All staff brought onto site in connection with this work scope should be able to fluently speak, understand and write in English.

#### **CONTROLLED DISCLOSURE**

- d) Proof of qualification is to be supplied on request by the Employer for specific key resources.
- e) The Contractor ensures that all staff being brought onto Kusile site has a valid fitness certificate based on the specified plant man-job specification.
- f) Provide daily supervision of all related plant through trained and competent personnel to ensure that inspections & work activities are conducted daily during execution of the outage.

## **2.6 Process for Monitoring**

Process will be agreed by both parties per task order according to outage process control manuals and the outage scope of work.

## **2.7 Related/Supporting Documents**

Noted

# **3. Chimney Outage Scope of Work**

## **3.1 Background**

The corrosive environment in the entire flue duct requires an internal and external assessment of the steel and coating systems, to ensure the condition and protection of the stainless-steel flues is acceptable for continued use. The scope of the repairs will be from the outlet of the absorber, through the reinforced concrete windshield to the flue outlet at a height of 220m. The scope will include the repairs and testing of the following:

- a) Fibre glass material on the horizontal flue inlet section
- b) Stainless steel vertical flue section
- c) Polyisobutene liner material on the steel flue section above the concrete windshield
- d) Borosilicate glass (thermal brick) liner on the interior surface of the steel flue

The chimneys at Kusile are multi-flue, single chimneys serving three boilers each. Three (3) flues are housed inside one reinforced concrete windshield. For each unit, the gas flue begins at the absorber outlet and enters the concrete reinforced windshield at the forty-five meter (45m) level above ground. The chimneys release the flue gases at a height of two hundred and twenty meters (220m).

### **3.1.1 Horizontal Flue Inlet**

The horizontal section is made from a fibre glass material with eleven (11) sections and three (3) expansion joints. The rubber expansion joints reduce tension and absorb thermal expansion or vibration. The expansion joints also have a connection to downpipes at each base for any condensate that forms in the flue. This also drains any condensate collected from the vertical flue.

### **3.1.2 Stainless Steel Vertical Flue**

Twenty-two (22) of the twenty-four (24) flue steel cans are coated with an epoxy primer to protect the steel of the flue from deterioration. To prevent damage over time on the steel of the flue above

**CONTROLLED DISCLOSURE**

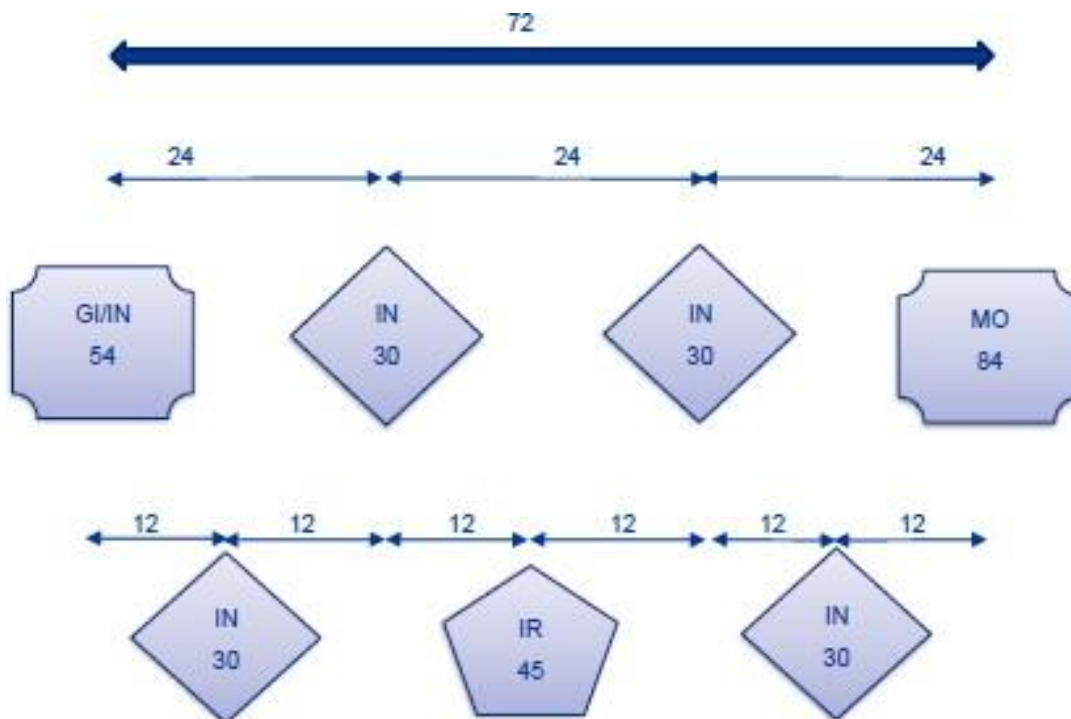
the concrete windshield, a polyisobutene material together with a fluorine-based plastic (ETFE) was applied to form a single layer of protection against high temperatures and chemical resistance.

### 3.1.3 Flue Internal Lining

The interior surface of the steel flue is lined with borosilicate glass blocks in order to protect against continuous operating temperatures of 100-170°C and against acid gas. These blocks are attached to the surface using a durable and flexible adhesive to resist the harsh conditions during operation.

## 3.2 Outage Philosophy






This scope of work is applicable to the Station's chimneys, as and when required. The system is also aligned to Kusile Power Station's Outage Philosophy depicted in Figure 1. The philosophy is reviewed yearly.



**Figure 1: Outage Philosophy**

**CONTROLLED DISCLOSURE**

**Table 1: Outage philosophy breakdown**

Symbol	Outage type	Interval Years	Interval Hours	Duration (days)	Main activities
	IN	1	8333	30	Boiler and Draught Group inspection Mill bin inspection Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, Oxy-Blower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	IN	2	16666	30	Boiler and Draught Group inspection Mill bin inspection Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, Oxy-Blower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	IR	3	25000	45	LP Bypass Valves inspection and repairs Boiler and turbine auxiliaries inspection and repairs Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, Oxy-Blower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	MGO	6	50 000	84	HP and IP turbine cylinders full refurbishment. LP cylinder and Valves overhaul Boiler statutory inspections Generator stator and rotor inspections Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, Oxy-Blower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	GO	12	100 000	84	HP, IP, LP Turbine cylinders and Valves overhaul Air heater element packs will be replaced every 12 years Boiler statutory inspections Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, Oxy-Blower and Reaction Tanks - Cleaning, Inspection and Refurbishment

**CONTROLLED DISCLOSURE**

### **3.3 Scope Details**

The scope of work shall include the following:

- Perform internal and external repairs of the chimney flues and its associated lining systems (incl. expansion joint and supports) as and when required. The typical repairs shall include, but not limited to:
  - Paint degradation, rust, corrosion, bolt connections, deteriorating weld connections, and condition of expansion joints.
  - Build-up of slurry, condition of the liner, condition of the expansion joints
  - Build-up of slurry, condition of stopaq protective system, and thermal cracks,
  - Condition of stopaq protective system system, stainless-steel conditions (if already exposed to the environment), condition of the cat ladders, build-up of slurry on roof deck.
  - Slurry build-up on interior flue duct liner (borosilicate glass), if required pending inspection.
  - Slurry build-up on roof deck.
- Submit a repairs databook for all the work that has been done.

#### **3.3.1 Constraints on how the Contractor Provides the Works**

Test, and remedial work activities can only be performed during outages or when the units are off.

### **3.4 Exclusions**

N/A

## **4. Acceptance**

This document has been seen and accepted by:

## **5. Revisions**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
August 2022	1	N. Tshabalala	New document

### **CONTROLLED DISCLOSURE**

Date	Rev.	Compiler	Remarks
February 2025	2		Inspections activities have been removed

## **6. Development Team**

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

## **7. Acknowledgements**

Not applicable

### **CONTROLLED DISCLOSURE**