

	Specification	Kusile Power Station
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Title: Kusile Power Station Provision of Boiler Washing, Station Cleaning, Vacuuming, and cleaning of Inaccessible Areas at Kusile for a period of 5 years during Outages

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CONTROLLED DISCLOSURE

1. Introduction

Kusile Power Station Management has taken a decision to outsource Boiler Washing, Station Cleaning, Vacuuming and cleaning of Inaccessible Areas at Kusile for a period of 5 years as and when required during Outages to a suitably qualified, experienced, and well-established Contractor.

This document describes the detail of the applicable plant areas, 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

This document gives a detailed scope of work for Provision of Boiler Washing, Station Cleaning, Vacuuming, and cleaning of Inaccessible Areas at Kusile for a period of 5 years. The scope of work is to enable the Contractor to compile and submit a quotation of required services. The scope will be on an as and when required basis.

2.1.1 Purpose

The purpose of this document is to define the specified Provision of Boiler Washing, Station Cleaning, Vacuuming, and cleaning of Inaccessible Areas at Kusile for a period of 5 years.

The station is expected to perform at EAF:85%, PCLF:10%, UCLF: 5% and the specified Boiler Washing, Station Cleaning, Vacuuming, and cleaning of Inaccessible Areas activities and management strategy efforts must support this requirement. It is therefore imperative that the successful and suitably qualified Contractor aligns his/her organisation fully to these specified scope activities and processes laid down in this document.

2.1.2 Applicability

This document is applicable to Kusile Power Station Generation

2.1.3 Effective date

This document will be effective from the date of authorisation.

2.2 Normative/Informative References

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

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2.2.1 Normative

- [1] ISO 9001 Quality Management Systems
- [2] 240-106963417 Kusile Environmental Management requirements for Contract and Supplier
- [3] 240-105776552 Kusile Power Station Waste Management
- [4] OHSACT Occupational Health and Safety Act, 85 of 1993

2.2.2 Informative

- [5] ISO 14001: 2004 Environmental Management System.

2.3 Definitions

Definition	Explanation
Contractor	Service provider contracted to provide a specific service to Eskom, Kusile Power Station.
Employee	Person employed by Eskom, Kusile Power Station or the Contractor
Employer	Eskom, or Eskom Kusile Power Station or representative
Hygiene	Conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness
Site	All plant and equipment installed in the boundary fences of Kusile Power Station

2.4 Abbreviations

Abbreviation	Description
OEM	Original Equipment Manufacturer
AP	Appointed Person
BBDV	Boiler Blow Down Vessel
BO	Black Owned
BOP	Balance Of Plant
SOW	Scope of Work
SSC	Submerged Scraper Conveyor
BYO	Black Youth Owned
FGD	Flue Gas Desulphurization Plant
kW	Kilo Watt
L	Litre
HV	High Voltage (> 1000V)
HP	High Pressure
PCM	Process Control Manual

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NDT	Non-Destructive Testing
PCLF	Planned Capability Loss Factor
UCF	Unit Capability Factor
UCLF	Unplanned Capability Loss Factor
QA	Quality Assurance
QC	Quality Control

2.5 Roles and Responsibilities

Table below outlines the line of responsibility, accountability, and relevant stakeholders to be consulted and informed.

Responsible	Accountable	Consult	Inform
Contract Supervisor	Service Manager	<ul style="list-style-type: none"> - Commissioning Manager - Aux System Engineer - Aux Engineering Manager - Boiler System Engineer - Boiler Engineering Manager - Turbine System Engineer - Turbine Engineering Manager 	Risk, Procurement, Operating and Engineering
Assurance that all action listed in this procedure are undertaken (follow up, advice, consultation)	Implementation of this procedure, random reviews and audits for adherence, provide assurance that any deviations will be	Provide support, advice and communication with outside stakeholders where needed.	Planning and advice

2.5.1 The Employer

- Inform and issue the Contractor with the updated outage plan
- Ensure the SOW is issued to the Contractor in time to allow planning for the Outage
- 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).
- Areas of measurement include the Employer's key business indicators and will be redefined from time to time.
- Employer shall provide training for PSR, ORHVS, FFFR and any other training as deemed necessary by the Employer in line with the scope requirements.
- The Employer and Contractor in this SOW is committed towards the following.
 - Retention of critical skills

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- ii. Continuous cost reduction
- iii. Health & Environment Safety
- iv. Transfer of operational experience and skills

2.5.2 The Contractor

- a) Comply with the Employer's Environmental, Health and Safety standards, policies and procedures
- b) The Contractor shall compile improvement programmes to enhance plant performance and achieve cost reductions and the Employer will approve such programmes.
- c) The Contractor shall be responsible for all the unit Boiler ,Turbine; FGD and BOP internal and external cleaning as per the Employer's instructions.
- d) The Contractor shall be responsible for the inspection and cleaning and of all structural and support steel work in this scope of work but not limited to;
 - i. Walkways
 - ii. Grating
 - iii. Handrails
 - iv. Cat ladders
 - v. Hangers
 - vi. Structure Supports etc.
 - vii. Vessels
 - viii. Tanks
 - ix. Bunkers
 - x. All other related plant areas
- e) The following complementary services to improve Plant and labour performance can be defined as follows;
 - i. Project management
 - ii. Value engineering
 - iii. Procedure and documentation writing
 - iv. Compile and improve task list's

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- f) 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.
- g) Should the Employer become aware of any changes to the activity schedule (programme of notifications), the Employer may issue the Contractor with a revised programme.
- h) 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.
- i) The Contractor shall employ a competent person who is accredited and responsible to perform all statutory plant tests with regards to this SOW
- j) All works will be subject to anytime inspection by the Employer.
- k) The Contractor shall take cognisance of the fact that the contract start date can deviate.
- l) The Contractor to provide resources required to execute this scope and any changes to the crew must be negotiated and agreed upon with the Employer.
- m) This contract is for outage SOW and any other breakdowns that the Contractor will be required to perform within the scope boundaries of this contract.
- j) 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.
- k) The Contractor must ensure they have LAR training to clean at MV & LV rooms.
- l) The Contractor to provide equipment and tools required for the works
- m) The Contractor shall participate in improvement programs as stipulated by the employer.
- n) Contractor vehicles to comply with Eskom Vehicle Standards and Procedures.
- o) 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.
- p) All additional personnel and scope of work to be clarified with the Employer prior to work being done.
- q) Will be required to comply with the Employers process control manuals (PCM) that outlines the outage processes.

2.5.2.1 Re-commissioning

- a. The Contractor shall provide resources required for recommissioning of the plant after the works is completed in preparation for unit return to service

2.5.3 Management and Reporting

- a. The type of reports, level of detail and frequency of reporting will be mutually agreed 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 to be represented at all outage related meeting which may be daily, weekly or monthly.

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- c. The Contractor to be represented at all Employer safety meetings.
- d. The Contractor to 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 as and when required basis to discuss any technical details, or concerns.

2.5.3.1 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. Any other mobile equipment
- d. The Contractor shall be responsible for the regular inspections and daily equipment checks of the 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
 - v. Any other related training required

2.5.4 Project Implementation

- a. 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:
 - i. Site establishment
 - ii. Activities
 - iii. Manpower plan (Resource loaded)
 - iv. Organogram

Skills required and associated cost per skill (e.g. artisan, site manager, etc)

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2.5.5 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, read and write in English.
- 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

This process will be agreed by both parties as per purchase order and according to Outage process control manuals and the specific outage SOW

2.7 Related/Supporting Documents

- a. 240-133767920 Boiler washing Procedure.
- b. 240-134588958 GAH Internal Cleaning Procedure

3. The provision of Boiler Internal Washing and Industrial Cleaning

3.1 Scope of Work Requirements

The scope of work is applicable to Boiler Washing, Station Cleaning, Vacuuming, and cleaning of Inaccessible Areas at Kusile for a period of 5 years during Outages as and when required as per scope of work.

The system is also aligned to Kusile Power Station Outage Philosophy depicted as follows and gets reviewed yearly

Due to the PJFF design defect which leads to a reduced lifespan of filter bags, the unit Outage Philosophy will in the interim be driven by PJFF bag replacements which will occur every 12 months requiring a minimum duration of 14 days (breaker open to breaker close). Provision of 1% normal outage PCLF has been made to cater for Opportunity Outages (boiler tube leaks or any emergency repairs that might require plant shutdown).

The temporary Outage Philosophy is as depicted on the diagram below:

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The Outage Philosophy is as depicted on the diagram below.

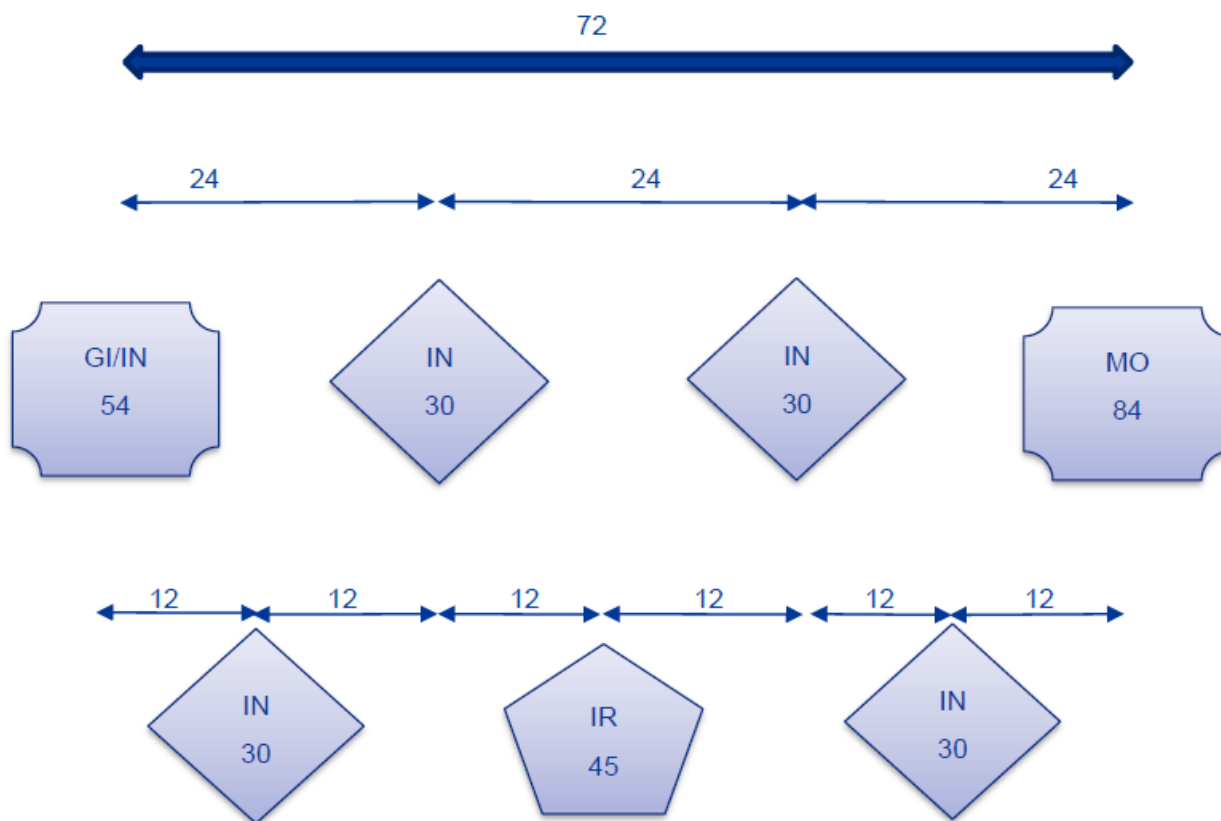


Figure 1: Outage Philosophy

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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

Table 1: Kusile Outage Philosophy

3.1.1 Applicable SOW

The scope of work covered by this contract is for the provision of Boiler Washing, Station Cleaning ,Vacuuming and cleaning of Inaccessible Areas at Kusile for a period of 5 years during Outages

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3.2 Boiler Plant

3.2.1 Pressure Parts

The contractor is required to internally wash the Kusile boilers from Unit 1 to 6. For each boiler, the washing shall be from 99m level to ground level, including the bottom ash hoppers, splash plates, dipper plates and De-gritting sump.

Boiler internal high pressure washing requires working around the clock. This an estimated time when there are shifts that work 24 hours each day. The contractor is to supply a submersible pump that can take suction up to 2 200mm water depth to empty the De-gritting sump.

The supplier should provide a pump that can deliver water at minimum of 8 bar operating pressure.

High pressure washing

The following areas to be internally high pressure washed using submersible pump connected from the point provided by the employer for the boiler washing purpose.

- Top and bottom banks of the economiser
- Economiser dead spaces
- Reheater 1 and 2
- Superheater1,2 and 3 (including the inlet and outlet elements)
- Internal side, front, rear and division wall. Front and rear economiser dead spaces
- Evaporator Walls

The contract shall supply own lights. After HP washing the boiler must be rinsed from 99m level down to bottom ash hoppers.

Draught Group internal and External Cleaning

The following areas shall be cleaned with the vacuum cleaner, brooms or rags:

- i. The area around PA fans to be cleaned
- ii. The area around FD fans to be cleaned
- iii. Water ingress to the fans to be cleaned
- iv. ID Fan ash pile up to be vacuum cleaned in the inlet and outlet duct
- v. Clean the area around the ID Fans due to ash hopper leaks
- vi. The ID Fan hydraulic oil skids should be cleaned
- vii. The PA Fan hydraulic oil skids should be cleaned
- viii. The FD Fan hydraulic oil skids should be cleaned
- ix. Remove ash in the secondary air cross-over duct

Boiler Associate Areas

The contractor shall clean all the accessible areas in the boiler.

The following areas are to be cleaned as a minimum with the vacuum blower, feather dusted or swept with the brooms:

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- i. Clean boiler beam and structures
- ii. Clean boiler external pipe works, tanks and vessels
- iii. Clean stairs and landing or platforms
- iv. Vacuum with portable vacuums and structures which are accessible
- v. Boiler beams, structures, tanks, pipework, vessels which can be reached.
- vi. Wash and mop every cement floors.
- vii. All ash collected must be disposed in the ashing systems.
- viii. Forced draught fans inlet screens
- ix. Wash floors on the Boiler plant
- x. De-gritting sump to be vacuum cleaned with the vacuum truck

3.3 Flue gas duct Cleaning

The following areas shall be vacuum cleaned, feather dusted and the dust accumulated on the ground floor swept with the brooms:

- i. Clean flue gas duct from boiler outlet duct at 99m level
- ii. Clean boiler external 100m level to 0m level
- iii. Clean PJFFP external and below hoppers
- iv. Clean on compressor house, internally and externally
- v. Clean stairs and landing or platforms on Boiler Plant, PJFFP Plant
- vi. Clean hoppers on Flue Gas Bin, PJFFP hoppers
- vii. Clean flue gas duct between GAH and PJFFP
- viii. Clean flue gas duct to the PJFFP and FGD
- ix. Clean the ID outlet duct to the FGD
- x. Clean flue gas duct between FGD and Smoke stack
- xi. Clean Boiler header boxes from 100ml
- xii. Clean secondary crossover duct
- xiii. Steam Air heater to be vacuum cleaned
- xiv. De-gritting sump to be vacuum cleaned with the vacuum truck
- xv. Burners to be cleaned with the vacuum blower
- xvi. Flue Gas Duct Hopper
- xvii. Cleaning around the burners

3.4 Pulse Jet Fabric Filter Internal and external Cleaning

The following internal cleaning has to be completed for the system

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- i. Ash accumulated on the clean gas chamber tube sheet, doorways, and from the cell ventilation system connection points as a result of filter bag leakages must be removed before unit is returned to service.
- ii. Cleaning internal ash hoppers
- iii. Ash hopper splash plates and dipper plates
- iv. Cleaning on the walks ways on all PJFFP system levels

3.5 Flue gas duct ash handling system

No internal cleaning is required for this system. Ash accumulated on +0m level in the area surrounding the ash storage bin, on the water supply line, conveying line, all valves and C&I equipment must be removed .

- Flue gas ducting, the ash accumulated to be removed

3.6 Coal milling plant

The Milling plant will need extra cleaning for the outage in the following area:

- General cleaning around the mills during the Outage
- Clear coal in the mill feeders and bunkers

3.7 Turbine Plant

3.7.1 Main Condensate, Low Pressure Heating and Condensate Make up

The following areas shall be vacuum cleaned, feather dusted and the dust accumulated on the ground floor swept with the brooms

- i. Cleaning of the ACCCT floor and below ACCCT
- ii. Cleaning of the ACCCT floor an above ACCCT
- iii. Cleaning of the floor under ACCCT floor (Condensate polishing plant inlet and outlet valve)
- iv. Cleaning of LP Heater 1,2 & 3 area
- v. Cleaning of LP Heaters Drains Recovery Pump(DRP) area
 - Cleaning of DRP
 - Cleaning of DRP motor and coupling
- vi. Cleaning of the CPP house floor (under ACCCT)
- vii. Cleaning CEP house
- viii. Cleaning around Condensate Reserve Pump
- ix. Process drain sump to be vacuum cleaned with the vacuum truck

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3.7.2 Feed Water and HP Heating System

The following areas shall be vacuum cleaned; the oil spillage shall be cleaned with the dry-zit provided by the employer and disposed in area provided by the employer for oil disposal taking environmental oil spillage cleaning requirements into consideration

- i. Cleaning of oil around boiler feedwater pump train (Booster pump to main pump train):0m level
- ii. Cleaning of BFP motor, Vorecon and their couplings
- iii. Booster pump and main pump
- iv. Cleaning of oil spillage of BFP lube oil system
- v. Cleaning of concrete floors on BFP area and BFP Lube oil system area
- vi. Cleaning below Feed water Tank and vessel
- vii. Cleaning of concrete floor on the Feedwater Tank
- viii. Cleaning of HP Heaters vessels and floor
- ix. Cleaning of Hydraulic skid unit oil spillages for BFP minimum flow valves

3.7.3 Turbine Centreline and Auxiliary systems

The following areas shall be vacuum cleaned; the oil spillage shall be cleaned with the dry-zit provided by the employer and disposed in area provided by the employer for oil disposal taking environmental oil spillage cleaning requirements into consideration

- i. Cleaning lube oil room and on-top of tank with the vacuum blower or feather dust
- ii. Cleaning of turbine floor (+9m level) with the brooms
- iii. Cleaning of turbine floor trenches (+9m level)
- iv. Cleaning of LP Bypass area and hydraulic skids surfaces with the vacuum blower and brooms
- v. Cleaning dust/bird droppings off turbine cylinders(externally) Inc. Exhaust ducts inside turbine hall
- vi. Cleaning dust/bird droppings off Generator external/casing with the rags, feather dust or vacuum blower
- vii. Cleaning dust/bird droppings off the turbine external casings with the feather dust or vacuum blowers
- viii. Cleaning of Generator Auxilliary skids (seal oil stator cooling water and gas cooling)
- ix. Cleaning of the oil transfer station with the Dry zit and brooms at -5m level
- x. Cleaning Turbine oil purification plant (Outside plant) Dry zit and brooms -5m level

3.7.4 Air Cooled Condenser

The following areas shall be cleaned with the vacuum blowers or feather dust and the dust accumulated on the ground floor swept with the brooms:

- i. Cleaning around the turbine condensate drain pumps area including the motors
- ii. Cleaning of the ACC fans motors with the feather dust, rags or vacuum blower

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- iii. Cleaning of the ACC fans walkways (streets) with the broom or vacuum blower
- iv. Cleaning of the area around the ejectors with the brooms or vacuum blowers

Auxilliary Plant

The plant will need extra cleaning for the outage in the following areas:

- i. Bottom Ash Hopper area
- ii. Course Ash Conveyoyr area
- iii. Compressor house to be cleaned in case the area is contaminated with the ash during Outages.
- iv. PJFF conveying system.
- v. Cleaning of the cooling water ponds when required.

The following external cleaning must be conducted:

- i. Ash on top of dome valves (ETG slave valve) and the surrounding areas to be removed
- ii. Ash accumulated on +0m level on the area under the PJFFP must be removed
- iii. Ash hopper splash plates and dipper plates
- iv. SSC to be internal cleaned after the boiler pressure part activities
- v. The area(external) around SSC to be cleaned

3.8 Electrical System

3.8.1 Generator & Generator Auxiliaries

- i. Generator casing -wiping only, lightly soaped cloths if necessary, no high pressure washing.
- ii. Area around generator auxiliary skids (seal oil, stator water and H2 cooling)- floor cleaning with the brooms ,removal of debris only.
- iii. 9ml turbine floor-clean floor area surrounding generator prior and after to setting up of clean conditions for generator SOW

3.8.2 Motors & VSDs

- i. CEP VSD Room -floor cleaning with the brooms, removal of debris only, not switchboards

3.8.3 Export system & Transformers

- i. Generator Transformer,2x Unit transformers,4x Auxiliary transformers-bund area should be cleaned thoroughly and all debris removed. To be cleaned after specialised transformer cleaning scope is executed.
- ii. IPB to be cleaning with the vacuum blower or rags at the end of an Outage.

3.8.4 Cables:

- i. U1 to U6 13.6ml cable tunnel cleaning -cleaning of floors with the broom, feather dusting, removing of debris

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- ii. U1 to U6 6.6ml cable tunnel cleaning -cleaning of floors with the broom, feather dusting, removing of debris
- iii. U1 to U6 5.5ml cable tunnel cleaning -cleaning of floors with the broom, feather dusting, vacuum blower, removing of debris

Please note the Contractor shall provide everything else necessary for providing the Service and also provide any necessary cleaning service that might be required within Kusile Power Station Premises as per the Contract Manager instruction.

3.8.5 Contactor to clean all the inaccessible areas in the boiler, turbine, PJFFP and DHP using rope access. The following areas to be cleaned as a minimum. The Service Manager may instruct the contractor to clean any of the areas not mentioned here as long as it is in Kusile Power Station from coal plant to generator Transformer yard.

103 m level beams above the boiler roof

12 m level FD Fans inlet screens

All boiler structural beams from 103 to 0 m level

All secondary air ducting roof

All burner secondary air ducting roof

All HP Pipework

3.9 Special Conditions

The Boiler is regarded as confined space and entry certificate need to be issued before work can commence:

- i. Turbine is regarded as moving machinery, before cleaning the permit is required
- ii. There is high dust levels on the plant
- iii. Other contractors and Eskom employees needs access to the boiler and Turbine Plant
- iv. Cleaning is from 100m level to 0m level on Boilers, the work involves working at heights and confined space
- v. Heat stress consideration during the commissioning or in a confined space
- vi. Rotating equipment (i.e., turbine, motors, GAH, Pumps might be on barring or rotating)
- vii. Electrical circuit might be alive

3.10 Exclusions

- i. Scaffolding and Insulation
- ii. Electrical and Control Instrumentation components
- iii. Non-destructive testing
- iv. Lubrication
- v. Unauthorised modifications
- vi. Civil Maintenance

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4. Acceptance

This document has been seen and accepted by:

Name	Designation
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5. Revisions

Date	Rev.	Compiler	Remarks
May 2024	2	M Ngwane	1 st review
November 2019	1	M Tshehla	1 st issue

6. Development Team

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

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- Maxwell Dlamini
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7. Acknowledgements

Not Applicable

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