Eskom	Specification	Kusile Power Station

Title: **Kusile Power Station Generator and Electrical Unitized Plant for work during outages to a suitably qualified, experienced and well-established Contractor for 5 years on an "as and when required basis**

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Contents

1. Introduction

Kusile Power Station Management has taken a decision to outsource Generator and Electrical Unitized Plant for work during outages to a suitably qualified, experienced and well-established Contractor.

This document describes the details 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

2.1.1 Purpose

The purpose of this document is to define the specified Kusile Power Station Generator and Electrical Unitized Plant for work during outages to a suitably qualified, experienced and well-established Contractor for 5 years on an "as and when required" basis.

The station is expected to perform at 92% UCF, 6% PCLF and 2% UCLF, and the specified Generator and Electrical Unitized Plant electrical maintenance work during outage to a suitably qualified, experienced and well-established Contractor for 5 years on an "as and when required" basis activities and management strategy efforts must support this requirement.

It is therefore imperative that the successful and suitably qualified Contractor aligns his/her organization fully to these specified scope activities and processes laid down in this document.

2.1.2 Applicability

This document shall apply throughout Eskom Kusile Power Station.

2.1.3 Effective date

This document is effective upon authorization.

2.2 Normative/Informative References

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

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] KUS-20230331 Kusile Power Station Quality Control

[3] KUS-20230330 Kusile Power Station Quality Control Plan Template

[4] 240-90824577 Kusile Power Station - Generator and auxiliaries Maintenance Strategy

[5] 240-92653771 Kusile Power Station Export System Maintenance Strategy

[6] 240-87435066 Kusile Power Station Power Transformer Maintenance Strategy

[7] 240-8738453 Kusile Power Station - MV Motor Maintenance Strategy

[8] 240-87810958 Kusile Power Station MV Switchgear & VSD Maintenance Execution Strategy

[9] 240-90049673 Kusile Power Station LV Switchgear Maintenance Execution Strategy

[10] 240-56535985 Operations Management of MV Switchgear Used in Eskom Power Stations Work Instruction

[11] 240-56227573 Air-Insulated Withdrawable AC Metal-Enclosed Switchgear and Control gear for Rated Voltages Above 1kV up to and including 52kV

[12] SANS 62271 High-Voltage Switchgear & Control Gear (Part 1, Part 100, Part 102 & Part 200)

[13] 240-56358993 Standard for the Maintenance of Power Transformers

[14] 240-161695070 Kusile Power Station MV Motors Commissioning Work Instruction

[15] ISO 9001:2015 ISO 9001 Quality Management Systems.

[16] OHS ACT Occupational Health and Safety Act, 85 of 1993.

[17] 240-81951984 Kusile Outage Philosophy.

[18] 240-114967625 Operating Regulations for High Voltage Systems

[19] 240-150642762 Generation Plant Safety Regulations

[20] 240-150642762 Plant Safety Regulations

[21] 240-114967625 High Voltage Regulations (ORHVS)

[22] 240-134567773 Kusile Power Station Integrated Risk Management Work Instruction.

[23] NMP47-7 Rev 0 Application of KKS Plant Coding

2.2.2 Informative

[24] 240 -111098236 Kusile Power Station Issue Management Work Instruction

[25] OHSACT Corrective and Preventative Action Management Work Instruction

[26] NP-7502 Electric Motor Predictive & Preventative Maintenance Guide (EPRI)

2.3 Definitions

Definition	Explanation
Contractor	Service provider contracted for supplying specific service to Eskom, Kusile Power Station.
Employer	Eskom, Kusile Power Station
Employer Representative	Any person appointed in writing by Employer as the delegated Employer representative in terms of the provisions.

Definition	Explanation
Plant	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.
Outage Permit to Work	The Permit to Work System at Kusile Power Station based on the Plant safety Regulations 36/681 Section 8 Declared Outages at Power Stations to maintain and repair plant and to return it to service.
Isolate, Isolated, isolation or Isolating:	Refers to the disconnecting of the apparatus to form a visible air gap from all possible sources of electrical potential.
Responsible Person	Means a person, whether an employee or another person, who has been authorized to be responsible for ensuring the work of the apparatus covered by a work permit can be carried out with safety and within the terms of these regulations.

2.4 Abbreviations

Abbreviation	Explanation
BTS	Inspections
CV	Curriculum Vitae
DC	Direct Current
GO	General Overhaul
ISO	International Standardization Organization
IR	Interim Repairs
IN	Inspection outage
KV	Kilovolts
LV	Low Voltage
MGO	Mini General Overhaul
MV	Medium voltage
OEM	Original Equipment
OHS	Occupational Health and Safety
OHRSV	Operating Regulations for High Voltage systems
PCLF	Planned Capability Loss Factor
PTW	Permit to Work
PPE	Personal Protective Equipment
PSR	Plant safety Regulation
PCM	Process Control Manual
RP	Responsible Person
QA	Quality assurance
SAP	System Applications Products

Abbreviation	Explanation
SOW	Scope of Work
UCF	Unit Capability Factor
UCLF	Unplanned Capability Loss Factor
QC	Quality Control

2.5 Roles and Responsibilities

Note: Further roles and responsibilities can be obtained from the NEC3 TSC.

2.5.1 The Employer

The responsibilities of the Employer include the following:

1. Inform and issue the Contractor with the updated outage plan.
2. Employer will ensure the SOW is issued to the Contractor on time to allow planning for the Outage.
3. Performance is measured by the Employer against those areas which contribute to the Employer's business, and it will serve to determine the continuous improvement.
4. Employer shall provide training for PSR and any other training as deemed necessary by the Employer in line with the scope requirements.
5. Employer to determine what should be repaired on site and what should be send away for repairs.
6. All works will be subject to anytime inspection by the Employer.
7. The Employer and Contractor in this SOW is committed towards the following:
    i. Continuous cost reduction
    ii. Retention of critical skills
    iii. Health & Environment Safety
    iv. Transfer of operational experience and skills

2.5.2 The Contractor responsibility

1. The Contractor shall comply with the Employer's SHEQ standards, policies and procedures.
2. The Contractor shall hold valid PSR and ORHVS authorizations prior to the execution of any activities.
3. The Contractor shall issue the employer with method statement for all works to be done under the SOW
4. The Contractor shall supply all relevant PPE for high-voltage and low-voltage plant.
5. The Contractor shall compile improvement programmes to enhance plant performance and achieve cost reductions and the Employer will approve such programmes.

6. The Contractor shall be responsible to dispose the end-product to designated disposal site, before disposal, the Contractor must consult the Employer.
7. The Contractor shall ensure that all platforms, gratings, handrails and cat ladders removed by him/her are thereafter re-instated into original base as per structural standards.
8. The Contractor shall take cognizance of the fact that the contract start date can deviate.
9. 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.
10. The Contractor shall ensure the integrity of plant labelling and that deficiency with regards to KKS labelling is reported immediately. All KKS removed during repairs to be put back in correct position.
11. The Contractor must ensure that they have responsible persons in terms of PSR for any work performed on plant.
12. The Contractor to provide equipment and tools required for the works.
13. The contractor shall produce a final report within 30 working days after the date of completion of the of the works or any date agreed on as per Task Order.
14. Contractor vehicles to comply with Eskom Vehicle Standards and Procedures.
15. 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.
16. The Contractor must be able to make use of Primavera, or any project software agreed with the Employer for project tracking and reporting purposes.

2.5.3 Re-commissioning

1. The Contractor shall be responsible or held liable for any defects arising from outage/operational faults after an intervention, provided that the equipment has been placed into service.
2. The defect liability period is 52 weeks after outage completion or as agreed on contract.
3. The Contractor shall provide resources required for recommissioning of the plant after the works is completed in preparation for unit return to service.

2.5.4 Management and Reporting

1. 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.
2. The Contractor to be represented at all outages related meeting which may be daily, weekly or monthly.
3. The Contractor to be represented at all Employer safety meetings.

4. The Contractor to be represented at any ad-hoc meetings that may arise to address any outage planning, execution, finalization, or safety related matters.
5. 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.

2.5.5 Contractor's Management Meetings and Key People

1. 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.
2. 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.
3. The Contractor must ensure that all test equipment's are calibrated, and the calibrated certificates are valid, this includes but not limited to:
    i. Electrical tests equipment
4. The Contractor shall be responsible for the regular inspections and daily test equipment checks of the electrical testing tools including record keeping while onsite.
5. The Contractor must ensure that all personnel performing work on the plant are authorized, this includes but not limited to:
    i. Confined space locations
    ii. Working at heights
    iii. Heat stress areas
    iv. Hazardous substances
    v. High voltage regulations

2.5.6 Communication and Correspondence

1. All correspondence includes but not limited to:
    i. Kusile Power Station
    ii. Employer's Contract number
    iii. Contract description
    iv. Correspondence subject matter
    v. Employer's name and contact details
    vi. Contractor contact details
    vii. Date
2. Where appropriate the correspondence includes the Employer's reference and is delivered as a single package or as per the agreed contract terms.

3. The Contractor shall communicate with the Employer by form of telephone and writing.

2.5.7 Quality and Documentation Control

1. During the tender process, a quality criterion will be defined that the Contractor must comply to.
2. The Contractor to compile a specific outage quality management plan for the specific SOW and will be approved by the Employer's delegated person, usually the System Engineers.
3. The Contractor shall ensure that the QCP has been approved by the Employer before commencing with the work
4. The Contractor shall ensure that any witness, hold, and inspection points are strictly adhered to.
5. The Contractor to ensure that all measuring and test equipments are calibrated at all times & proof thereof must be readily available.
6. All Quality References and Standards as stipulated in this document will be adhered to.
7. The Contractor to comply with the Employer's quality documentation management system and processes.
8. All electrical test results, methods statement and data packs shall be recorded on the check sheets as specified in the Kusile procedure. [14]

2.5.8 Project Implementation

The Contractor shall supply an outage execution plan per outage including at least the following in Primavera or any project software agreed with the Employer.

i. Site establishment
ii. Activities
iii. Manpower plan (Resource loaded)
iv. Organogram
v. Skills required and associated cost per skill (e.g. artisan, site manager, etc.)

2.5.9 Manpower Requirements

1. 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.
2. The successful Contractor shall utilize/provide skilled and suitably qualified staff with experience in the technical aspects of this SOW and supporting teams.
3. Key staff brought onto site in connection with this scope of work should be able to fluently speak, understand and write in English.
4. Proof of qualification is to be supplied on request by the Employer for specific key resources.
5. The Contractor ensures that all staff being brought onto Kusile site has a valid fitness certificate based on the specified plant man-job specification.

6. 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.
7. Electrical tests must be conducted by qualified personnel using calibrated test equipment.
8. All staff shall be adequately qualified and competent of performing all work within safe and correct technical specifications.
9. CVs of all supervisors, quality technicians, artisan, stating qualifications and relevant experience will be provided at least two weeks before commencement of outage.

2.6 Process for Monitoring

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

2.7 Related/Supporting Documents

N/A

3. Works information

3.1 Outage Philosophy

The scope of work is applicable to the Kusile Power Station Generator and Electrical Unitized Plant for work during outages to a suitably qualified, experienced, and well-established Contractor for 5 years on an "as and when required" basis. The system is also aligned to Kusile Power Station Outage Philosophy depicted as follows and gets reviewed yearly.

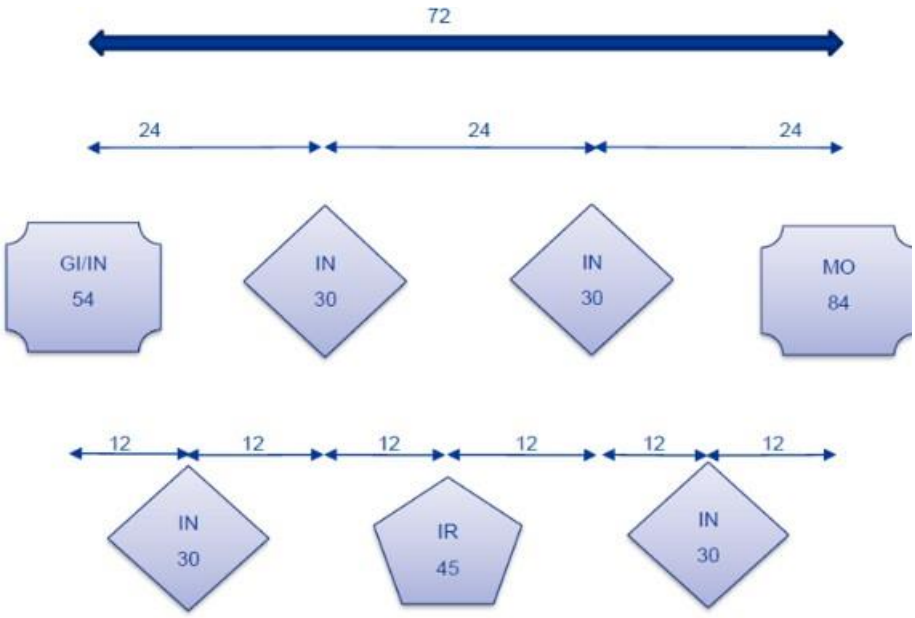

Figure 1 Outage Philosophy

Table 1 Kusile Outage Philosophy Outage Intervals

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, OxyBlower 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, OxyBlower 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, OxyBlower 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, OxyBlower 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, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment

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3.2 Applicable Plant Area

3.2.1 Applicable SOW

The scope of work includes but not limited to cleaning, visual inspections, disconnection, repairs, reconnection, electrical testing, replacement, and fault-finding of the following systems:

1. Power Transformers (Generator transformer (22/400KV, Unit Transformer ((22/15.75/15.75), Auxiliary transformers (15/6.9kV).)
2. LV and MV switchgears (15KV, 6.6KV, 400V)
3. LV and MV motors (15kV, 6.6kV)
4. Export system (Insulated phase bus, Excitation transformer, 22KV circuit breaker)
5. Generator and auxiliaries
6. Power cables

Additionally, the scope is not limited to addressing any emerging requirements or scope of work as identified by the employer.

The detailed outage philosophy scope of work will be provided covering the above-mentioned systems.

The high-level scope of work is included in Appendix 1.

3.2.2 Resources

The following resources are required to execute the above scope of work:

i. Site Manager
ii. Supervisor
iii. Planner
iv. Safety officer

v. Quality officer
vi. Material controller
vii. Site Clerk
viii. Semi-skilled
ix. Rigger
x. Fitter
xi. Electrician

Note: All components must be inspected for before work commences. After inspections, the detailed report must be issued to the Employer.

a) <u>Post-outage requirements:</u>

1. Attend and participate in station post-mortems for planned and unplanned outages.
2. Compile a comprehensive service report and submit to the electrical outage controller within 42 calendar days, containing the following minimum information:
   i. scope executed,
   ii. scope not executed (with reason)
   iii. reports of all inspections and tests conducted,

3.2.3 Exclusions

The following activities are excluded from the scope of work:

1. Scaffolding
2. Condition Monitoring
3. Lubrication
4. Unauthorized modifications
5. Supply of spares
6. Electrical Test on Power Transformers
7. High Pressure Cleaning of Power Transformers
8. Internal work on Power Transformers
9. Power Transformer Marshalling Kiosk
10. Excitation System Panels
11. Generator Protection (100% Stator E/F Panel) and Metering and Measurements Panels.
12. GCB Speed and DRM Testing.
13. Main CTs and Interposing CTs and Cubicles (Main and Neutral).
14. IPB Pressurization System
15. IJB at 400kV HV Yard
16. Reticulation protection system
17. Excitation HVAC System

4. Acceptance

This document has been seen and accepted by:

Full Name and Surname	Designation
Grace Olukune	Engineering Group Manager
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5. Revisions

Date	Rev.	Compiler	Remarks
April 2025	1	Collin Lepee	New document.

6. Development Team

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

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7. Acknowledgements

N/A

8. Appendix 1 High-level Scope of Work

Appendix 1.1 910MVA, 22/420kV GENERATOR TRANSFORMER SCOPE OF WORK

910MVA, 22/420kV GENERATOR TRANSFORMER SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
2	LV Bushings	Disconnect	Disconnect LV (22KV) copper flexibles and inspect contact area and bolts (store in a secure place). - Remove bellows - Disconnect flexible (912mm2 Copper Flexibles, Silver Plated) - Inspect flexibles for damages - Fit covers on IPB for preservation
3	LV Bushings	Reconnect	Reconnect LV (22kV) copper flexibles (912mm2 Copper Flexibles, Silver Plated) after electrical tests - Ensure contact area is clean - Connect copper flexibles - Tighten the connection using correct Torque setting - Fit bellows and correctly tied down. - Ensure rubber protection wedge is in place to protect bellow from tie down buckle. - Inspect and check of air leak
9	Surge Arrestors	Inspect	Inspect earthing on the surge arrestors (400KV): - Check for signs of corrosion, damage, or loose connections on all earthing component - Confirm earthing present & continuous. - Checking of proper contact. - Verify that earthing cable lugs are firmly attached, and screws are tightened securely, and check for any breaks or damage on the lugs. - Inspect cable connections for any damage or broken strands, and re-press or replace damaged cable - Ensure all contact surfaces on clamps and connections are clean and free from dirt, scale, or corrosion - Clean the contact area - Tighten the connection - Replace any missing earthing cables
10	Marshalling Kiosk	Clean and inspect	Inspect marshalling kiosk, IP55 - Clean marshalling kiosk. - Confirm the LCP doors close properly - Ensure door rubber seals are not damaged - Visually inspect earth cable all the way back to the main earth connection. - Locks and hinges should be lubricated with engine oil and surplus wiped off in order to prevent the collection of dust - Inspect anti-condensation heaters are working - Inspect lighting - Inspect 400V power supply connections for looseness - Seal all holes on the marshalling kiosk
12	Earthing	Inspect	Inspect earthing on the transformer tanks, neutral earthing, cubicles earthing, structure earthing, fence and gate earthing:

			- Check for signs of corrosion, damage, or loose connections on all earthing component - Confirm transformer earthing present & continuous. - Checking of proper contact of grounding connections at tank, cover, control cubicle, manhole covers, bushing flanges, protection devices, etc. - Verify that cable lugs are firmly attached, and screws are tightened securely, and check for any breaks or damage on the lugs. - Inspect cable connections for any damage or broken strands, and re-press or replace damaged cable - Ensure all contact surfaces on clamps and connections are clean and free from dirt, scale, or corrosion - Clean the contact area - Tighten the connections - Inspect earth tail connection for signs of rust and corrosion - Inspect conduits - Inspect earthing on the fence, structures, cubicles and gates, - Replace any missing earthing cables
15	Fan Motors, 400V, 5.5kW,	Test, inspect	Perform insulation resistance test on cooler fan motors400V, 5.5kW, Inspect power supply cables for loose connections
16	Bushings Neutral	Clean and inspect	Inspect bushing connections - Clean the contact area - Tighten the connection
17	Generator Transformer Tap Changer (Diverter Switch)	Tap Changer LCP Clean, Inspect & Test	Inspect marshalling kiosk, IP55 - Clean marshalling kiosk. - Clean the LCP internally - Confirm the LCP doors close properly - Ensure door rubber seals are not damaged - Visually inspect earth cable all the way back to the main earth connection. - Locks and hinges should be lubricated with engine oil and surplus wiped off in order to prevent the collection of dust

Appendix 1.2 110MVA, 22/15.75/15.75kV UNIT TRANSFORMER SCOPE OF WORK

110MVA, 22/15.75/15.75kV UNIT TRANSFORMER SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
2	HV Bushings	Disconnect	Disconnect 22KV HV copper flexibles (912mm2 Copper Flexibles, Silver Plated) and bolts (store in a secure place). - inspect contact area - Remove bellows - Inspect flexibles for damages - Fit covers on IPB for preservation
3	LV Terminals	Disconnect	- Open 15KV Terminal Cubicle - Disconnect 15KV LV cables. - Inspect cubicle and clean as required
4	NET (HV) & NER (LV)	Disconnect	NET (HV) & NER (LV) cables - Tighten the connection using correct Torque setting
5	HV Bushings	Reconnect	Reconnect HV copper flexibles. (912mm2 Copper Flexibles, Silver Plated) - Clean the contact area - Clean bushings - Tighten the connection using correct Torque setting - Install bellows and ensure correctly tied down. Ensure rubber protection wedge is in place to protect bellow from tie down buckle.
6	NER and NET Terminals	Reconnect	Reconnect NET (HV) & NER (LV) cables. - Tighten the connection using correct Torque setting
7	LV (15KV) Terminals	Reconnect	Reconnect 22KV LV cables after electrical tests - Ensure contact area is clean - Clean the terminal s - Connect LV cables - Tighten the connection using correct Torque setting - Install cubicle covers, use new gasket - Tighten cubicle bolts to ensure cubicle is properly sealed
8	Marshalling Kiosk	Clean and inspect	Inspect marshalling kiosk, IP55 - Clean marshalling kiosk. - Confirm the LCP doors close properly - Ensure door rubber seals are not damaged - Visually inspect earth cable all the way back to the main earth connection. - Locks and hinges should be lubricated with engine oil and surplus wiped off in order to prevent the collection of dust - Inspect anti-condensation heaters are working - Inspect lighting - Inspect 400V power supply connections for looseness - Seal all holes on the marshalling kiosk
9	Earthing	Inspect	Inspect earthing on the transformer tanks, neutral earthing, cubicles earthing, structure earthing, fence and gate earthing: - Check for signs of corrosion, damage, or loose connections on all earthing component - Confirm transformer earthing present & continuous.

			- Checking of proper contact of grounding connections at tank, cover, control cubicle, manhole covers, bushing flanges, protection devices, etc. - Verify that cable lugs are firmly attached, and screws are tightened securely, and check for any breaks or damage on the lugs. - Inspect cable connections for any damage or broken strands, and re-press or replace damaged cable - Ensure all contact surfaces on clamps and connections are clean and free from dirt, scale, or corrosion - Clean the contact area - Tighten the connections - Inspect earth tail connection for signs of rust and corrosion - Inspect conduits - Inspect earthing on the fence, structures, cubicles and gates, - Replace any missing earthing cables
11	Fan motors 400V, 2.2kW	Test	Perform IR and PI on fan motors , 400V, 2.2kW
12	Bund area	Clean	Clean bund area and remove all debris inside the yard. Ensure drain is not blocked.

Appendix 1.3 15.75/6.6kV SERVICE & AUX TRANSFORMERS SCOPE OF WORK

15.75/6.6kV SERVICE & AUX TRANSFORMERS SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	HV Bushings	Disconnect	Disconnect 15 KV cables - Open terminal cubicle - Clean the contact area - Inspect contact area and bolts - Inspect cables and connections for any damages - Inspect connections for overheating - Check the porcelain for any damages. - Make sure there is no oil leakage. - Tighten the connection using correct Torque setting - The outside terminal should be screwed to the conducting rod, making sure that it will not remain loose. - Make sure that the terminal face which is going to be in contact with other materials will not be damaged. - When installing the cable, make sure not to apply too much strain to the bushing end.
2	LV Terminals	Disconnect	Disconnect 6.6KV cables - Open 6.6 KV Terminal Cubicle - Clean the contact area - Inspect contact area and bolts - Inspect cables and connections for any damages - Inspect connections for overheating - Check the porcelain for any damages. - Make sure there is no oil leakage. - Tighten the connection using correct Torque setting - The outside terminal should be screwed to the conducting rod, making sure that it will not remain loose. - Make sure that the terminal face which is going to be in contact with other materials will not be damaged. - When installing the cable, make sure not to apply too much strain to the bushing end.
3	Neutral earthing bushing	Reconnect	- Reconnect neutral earthing cable
4	LV (15KV) Terminals	Reconnect	Reconnect 22KV LV copper flexibles after electrical tests - Ensure contact area is clean - Connect LV cables - Tighten the connection using correct Torque setting - Install cubicle covers, use new gasket - Tighten bolts to ensure cubicle is properly sealed

5	Marshalling Kiosk	Clean and inspect	Inspect marshalling kiosk, IP55 - Clean marshalling kiosk. - Confirm the LCP doors close properly - Ensure door rubber seals are not damaged - Visually inspect earth cable all the way back to the main earth connection. - Locks and hinges should be lubricated with engine oil and surplus wiped off in order to prevent the collection of dust - Inspect anti-condensation heaters are working - Inspect lighting - Inspect 400V power supply connections for looseness - Seal all holes on the marshalling kiosk
6	Neutral earthing bushing	Reconnect	Reconnect neutral earthing Tighten the connection using correct Torque setting
7	Earthing	Inspect	Inspect earthing on the transformer tanks, neutral earthing, cubicles earthing, structure earthing, fence and gate earthing: - Check for signs of corrosion, damage, or loose connections on all earthing component - Confirm transformer earthing present & continuous. - Checking of proper contact of grounding connections at tank, cover, control cubicle, manhole covers, bushing flanges, protection devices, etc. - Verify that cable lugs are firmly attached, and screws are tightened securely, and check for any breaks or damage on the lugs. - Inspect cable connections for any damage or broken strands, and re-press or replace damaged cable - Ensure all contact surfaces on clamps and connections are clean and free from dirt, scale, or corrosion - Clean the contact area - Tighten the connections - Inspect earth tail connection for signs of rust and corrosion - Inspect conduits - Inspect earthing on the fence, structures, cubicles and gates, - Replace any missing earthing cables
8	Fan motors 400V, 2.2kW	Test	Perform IR and PI on fan motors, 400V, 2.2kW
9	Bund area	Clean	Clean bund area and remove all debris inside the yard. Ensure drain is not blocked.

Appendix 1.4 22KV EXCITATION TRANSFORMER, EARTHING TRANSFORMER & RESISTOR, DRY TYPE TRANSFORMER SCOPE OF WORK

22KV EXCITATION TRANSFORMER, EARTHING TRANSFORMER & RESISTOR, DRY TYPE TRANSFORMER SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	Transformer tank	**Clean**	**Clean the transformer externally before opening covers** - Remove accumulated dust - On top of the tanks - Under the transformer tank
2	Junction Box	Clean & Tightness Check	In the local Junction Box - Inspect door, door seals and note any ingress (moisture or dirt). - Tightness checks all local JB wiring. - Clean the JB.
3	Transformer Active Part	Clean	Clean transformer internally - Open & clean the housing & transformer. - Perform Tightness check & torque check all relevant copper connections & links. - Clean the windings, copper busbars and remove any accumulated dust inside the transformer - Clean all filters
4	Earthing Transformer & Resistor	Clean, Inspect	Clean & inspect the following: - Clean all three (3) earthing transformers. - Clean all panel filters. - Ensure there is no copper discoloration. - Clean the earthing resistor. -Confirm all torque ratings on the copper flexibles.
5	Copper flexibles	Disconnect	Disconnect 22KV HV copper flexibles (912mm2 Copper Flexibles, Silver Plated) and bolts (store in a secure place). - inspect contact area - Remove bellows - Inspect flexibles for damages - Fit covers on IPB for preservation
6	Copper flexibles	Reconnect	Reconnect HV copper flexibles. (912mm2 Copper Flexibles, Silver Plated) - Clean the contact area - Clean bushings - Tighten the connection using correct Torque setting - Install bellows and ensure correctly tied down. - Ensure rubber protection wedge is in place to protect bellow from tie down buckle. - Check for leaks
7	Earthing	Inspect	Inspect earthing on the transformer tanks, neutral earthing, cubicles earthing, structure earthing, IPB: - Check for signs of corrosion, damage, or loose connections on all earthing component - Confirm transformer earthing present & continuous.

			- Checking of proper contact of grounding connections at tank, cover, control cubicle, manhole covers, bushing flanges, protection devices, etc. - Verify that cable lugs are firmly attached, and screws are tightened securely, and check for any breaks or damage on the lugs. - Inspect cable connections for any damage or broken strands, and re-press or replace damaged cable - Ensure all contact surfaces on clamps and connections are clean and free from dirt, scale, or corrosion - Clean the contact area - Tighten the connections - Inspect earth tail connection for signs of rust and corrosion - Inspect conduits - Inspect earthing on the fence, structures, cubicles and gates, - Replace any missing earthing cables

Appendix 1.5 22KV GENERATOR CIRCTUIT BREAKER, CT VENTILATION SYSTEM AND INSULATED PHASE BUS SCOPE OF WORK

22KV GENERATOR CIRCTUIT BREAKER, CT VENTILATION SYSTEM AND INSULATED PHASE BUS SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	Generator Circuit Breaker (GCB)	Clean & Tightness Check	Clean & inspect the following: - Ensure the LCP is dust free and there is no visible damage / discoloration. - Perform tightness checks on all power terminations - Reset the fan system, confirm both A & B fan systems are in working order. - Check SF6 gas density meter level. Take the cover off the main drive (Q0): - Ensure the drive is dust free & clean. - Inspect the pump motor bushings for excessive wear & the gear teeth for damage. - Confirm the drive space heater is working. - Confirm drive hydraulic oil level to be correct. Open the GCB top covers (all 3 phases): - Inspect & clean the entire GCB enclosure. - Check for any discoloration or damage to the components
2	Isolated Phase Busbars (IPB)	Clean & Inspect	*While the GCB top covers are open. * Inspect & clean the following: -All insulators (all 3 phases). Use inspection covers for access if required. -Clean all busbars internals. -Inspect all bellows. -Check if the insulation rubbers are still intact and that they are fit for insulation. -Clean with cloth moistened with alcohol or solvent.
3	Copper flexibles	Disconnect	Disconnect 22KV HV copper flexibles (912mm2 Copper Flexibles, Silver Plated) and bolts (store in a secure place). - inspect contact area - Remove bellows - Inspect flexibles for damages - Fit covers on IPB for preservation
4	Copper flexibles	Reconnect	Reconnect HV copper flexibles. (912mm2 Copper Flexibles, Silver Plated) - Clean the contact area - Clean bushings - Tighten the connection using correct Torque setting - Install bellows and ensure correctly tied down. - Ensure rubber protection wedge is in place to protect bellow from tie down buckle. - Check for leaks

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5	CT Ventilation System	Inspect, Clean & Replace	Clean & inspect the following: - Entire Gen CT ventilation skid and ducting. - Tightness check fan blades. - Ensure all air lines are clean and not - blocked. - Replace both sets of air filters. Inspect, Clean & Replace
6	CT Ventilation System	Function Test	Perform a function test of the entire CT ventilation system control system. Confirm motor protection and timer settings

Appendix 1.6 15KV, 6.6KV MEDIUM VOLTAGE MOTORS SCOPE OF WORK

15KV, 6.6KV MEDIUM VOLTAGE MOTORS SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	Draught Group: RH, LH ID, FD, PA Fan FGD: Recirc 21, 22, 23, 24. Oxyblower, PAC CPP, LPH2 DR. CEP BFP Mills	Inspect, Clean	Inspect motor externally for any damages and leaks Thoroughly clean motor externally Clean radiators and cooling tubes, where applicable Inspect earthing and replace missing earth
2	Draught Group: RH, LH ID, FD, PA Fan FGD: Recirc 21, 22, 23, 24. Oxyblower, PAC CPP, LPH2 DR. CEP BFP Mills	Test	Disconnect power supply cables on the motor. Ensure phases are marked (datum) Perform electrical tests: - Insulation Resistance (IR) - Polarization Index (PI) - Winding Resistance - Continuality test - Tan delta - Offline PD Reconnect power supply cables. Tighten the connection using correct Torque setting Close terminal box, ensure correct sealing to prevent water and dust ingress

Appendix 1.7 LOW VOLTAGE MOTORS SCOPE OF WORK

LOW VOLTAGE MOTORS SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	All LV motors	Inspect, Clean	Inspect motor externally for any damages and leaks Clean motor externally Clean radiators and cooling tubes, where applicable Inspect earthing and replace missing earth
2	All LV Motors	Test	Disconnect power supply cables on the motor. Ensure phases are marked (datum) Inspect terminal box for overheating Perform electrical tests: - Insulation Resistance (IR) - Polarization Index (PI) - Winding Resistance Reconnect power supply cables. Tighten the connection using correct Torque setting

Appendix 1.8 22KV TURBINE GENERATOR SCOPE OF WORK

22KV TURBINE GENERATOR SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	Brush gear brushes	Inspect	**Remove Brush gear Brushes.** Safely store the brushes for the duration of the outage - Inspect brushes, replace as required. - Inspect brush holders, ensure securely locked - Inspect RC module and fuses - Inspect springs
2	Sub-Distributor Cubicle	Test	Inspect and clean the generator sub distributor IP55 - Clean cubicle - Confirm the doors close properly - Ensure door seals are not damaged - Visually inspect earth cable all the way back to the main earth connection. - Locks and hinges should be lubricated with engine oil and surplus wiped off in order to prevent the collection of dust - Inspect anti-condensation heaters are working - Inspect lighting - Inspect 400V power supply connections for looseness
3	Rotor earthing strap and shaft voltage brushes	Inspect	Inspect and clean rotor earthing strap Inspect RC module Inspect voltage brushes Megger test brush assembly
4	Generator Bushings	Inspect, clean	Inspect bushing for contamination, overheating. Clean bushing
5	Copper flexibles	Disconnect	Disconnect 22KV bushing copper flexibles (912mm2 Copper Flexibles, Silver Plated) and bolts (store in a secure place). - inspect contact area - Inspect flexibles for damages Ensure there is sufficient lighting
6	Copper flexibles	Reconnect	Reconnect HV copper flexibles. (912mm2 Copper Flexibles, Silver Plated) - Clean the contact area - Clean bushings - Tighten the connection using correct Torque setting
7	Bearings	Test	Perform insulation test on the bearing

8	Bearings	Clean	Clean bearing pedestals
9	Gen rotor	Inspect	Inspect generator rotor shaft voltage earthing brushes - Check for dirt contamination and clean if required. - Check ease of movement of the brushes - Check brush running surface - Check brush length - Check that the locking devices are securely mounted. - Perform Insulation measurement. Measure insulation between brush bracket and the structure - Check RC-circuit fuse using ohmmeter.
10	Bush holders	Inspect	Inspect brush holder for dirt contamination and damages
11	Motors: Stator Cooling Water. Seal oil, H2 cooling, CO2 device	Test, Inspect, clean	Visual inspect motor for damages externally. Check earthing is intact. Review motor operating data - Clean motors externally - Disconnect, Perform IR test and reconnect - Termination tightness checks
12	Heaters: Stator water, seal oil, H2 dryer	Inspect, Test	Inspect and perform functionality test of the heater.

Appendix 1.9 15KV, 6.6KV, 400V SWITCHGEAR SCOPE OF WORK

15KV, 6.6KV, 400V SWITCHGEAR SCOPE OF WORK			
	COMPONENT DESCRIPTION	**ACTIVITY TYPE**	**WORK SPECIFICATIONS**
1	Unitized LV and MV boards(various)	Inspect, clean	Inspect and clean the boards Clean the entire board. This includes the busbar compartment. Ensure the panel is clean and dust free before closing. -Check for discoloration on all power cables. -Ensure isolators move freely once panel door is closed. -Inspect fire/vermin proofing. Barrier should not be compromised in any way. Inspect MV breakers spring limit switches
2	Unitized LV and MV boards(various)	Tightness checks	Inspect HV cable termination, ensure connections are torqued to correct values.