	<p style="text-align: center;">Scope of Work</p>	<p style="text-align: center;">Kusile Power Station</p>
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Title: Supply, Installation and Commissioning of ICP-OES, Particle Sizer.

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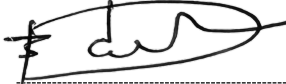
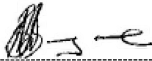

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Content	Page
1. Introduction.....	3
2. Supporting Clauses	3
2.1 Scope.....	3
2.1.1 Purpose.....	3
2.1.2 Applicability	3
2.1.3 Effective date.....	3
2.2 Normative/Informative References	3
2.2.1 Normative.....	3
2.2.2 Informative.....	4
2.3 Definitions	4
2.4 Abbreviations	4
2.5 Roles and Responsibilities	4
2.6 Process for Monitoring.....	4
2.7 Related/Supporting Documents.....	4
3. Required works.....	5
3.1 Specifications:	7
3.1.1 Particle Size Analyser	7
3.1.2 ICP OES.....	8
3.2 Commissioning.....	9
3.3 Transportation	9
3.4 Required instruments	10
4. Acceptance.....	10
5. Revisions.....	10
6. Development Team	10
7. Acknowledgements	10

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1. Introduction

This document serves as the SOW for the supply, installation, and commissioning of laboratory instruments, namely the ICP-OES, Particle sizer.

2. Supporting Clauses

2.1 Scope

The following SOW must be executed:

Supply, install and commission the ICP-OES for the determination of elements in water samples, for analysis of raw water, potable water and demineralized water samples, Particle Sizer for determination of size distribution of a suspension in a slurry sample. Provide all spares and consumables for all instruments, where required, as determined by the *employer*.

Provide after-sale service for these instruments i.e., periodic instrument servicing and technical support and spares on an ad hoc basis. The *contractor* shall provide a Quality Assurance plan in accordance with ISO 9001:2015 standards to the employer for approval and this plan shall form part of the *contract* as a requirement.

Execute all quality related activities including inspections and test & troubleshooting plans and on-job training, provide operating manuals in accordance with the ISO 17025 standards.

The contractor shall be subjected to all Eskom Kusile Power Station Safety, Health and Environmental regulation and rules and adhere to all these when in the premises.

2.1.1 Purpose

To ensure the supply, installation and commissioning of the lab instruments and ensure that all technical specifications, and all other terms pertaining to the stipulated scope of work are met.

2.1.2 Applicability

This document shall be applicable to Chemical Services Laboratory.

2.1.3 Effective date

This document is effective from date of signature

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] Good Laboratory practise

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2.2.2 Informative

- [1] KUS-202211140 Kusile Power Station Gypsum Chemistry Monthly Analysis Sheet
- [2] 240-165441379 Analytical Chemistry Equipment User Requirement Specification Guideline
- [3] KUS-202306176 Kusile Power Station TES for Supply Installation and Commissioning of ICP-OES Sodium Analyser Particle Sizer Density Meter

2.3 Definitions

N/A

2.4 Abbreviations

Abbreviation	Explanation
ICP-OES	Inductively Coupled Plasma Optical Emission Spectroscopy
SOW	Scope of Work
ppb	Parts per billion (unit of concentration for expressing number of species in solute at trace amounts)
ppm	Parts per million (unit of concentration for expressing number of species in solute at trace amounts)
IDG	Infinite Derivative Gra

2.5 Roles and Responsibilities

Department	Responsibility
Chemical Services	Draw up the SOW and submit to Engineering Clerk
Engineering	Engineering Clerk to draw a PR for the installation
Contractor	Execute the SOW to the required standard

2.6 Process for Monitoring

N/A

2.7 Related/Supporting Documents

N/A

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3. Required works

- Provide proof (in the form of a letter from RT&D) that the equipment proposed has/have been evaluated, recommended and declared suitable for use in Eskom. If this is not available, the supplier may be required to present the equipment for accelerated evaluation by RT&D.
- Industrial references (at least three references in the last three years), preferably where the equipment is been used in similar application to that intended by Eskom. This should include equipment installation and after-sales technical support.
- Provide the equipment installation and commissioning method statement of the proposed analytical chemistry equipment.
- Analytical chemistry equipment technical data sheets, operation, maintenance and troubleshooting manuals.
- Proof of competency and training records of service technicians/ engineers from the original equipment manufacturer (OEM).
- Estimated lead-time for the supply and delivery of chemistry equipment to be included in the tender returnable.
- The supplier should indicate all site services/utilities that are required to be provided by the Employer.
- Provide a separate analytical chemistry equipment life cycle cost budget for evaluation by Commercial/ Finance department to indicate if operation and yearly maintenance of the chemical equipment is cost effective
- Indication of all exclusions and deviations from the Works Technical Acceptance and Deviation Schedule (WTADS).
- Proof of OEM's certification in accordance with ISO 9001 standard.
- The *supplier* should indicate any other after-sale services available for the Employer to use or access.
- After installation and commissioning, the *contractor* to provide training on the equipment and systems included as part of the works to various departments of the Employer's technical staff.
- Each *Supplier* is required to obtain relevant samples from Eskom Kusile Power Station for performance testing of their instruments to give assurance of functionality of their instruments. This should indicate the standards used, test method, sample handling, accuracy, reproducibility, sensitivity, stability, life cycle of the instrument, internal data logger availability, reagent consumption.
- Training provided by the *Contractor* should be directly applicable to the actual equipment supplied for the works. Generalised training based on similar equipment is not acceptable.
- All training should consist of both theoretical and practical training sessions.
- The training should be structured such that competency test is done at the end of each training session for all the participants.
- The *Contractor* should provide all course materials including materials. All training should be in English and inclusive of all third-party documentation.

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- A copy of training documentation should be supplied to each trainee with additional master sets for the *Employer's* library and training department. All training materials should also be supplied in an electronic format for easy reference.

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3.1 Specifications:

3.1.1 Particle Size Analyser

- a) Provide a Particle size analyser and install all hardware components, electric cables, and updated software.
- b) Set up the software to employer desired requirements (must be set up to meet employer requirements).
- c) Calibrate the instrument and provide calibration certificate.
- d) Test-run the instrument.
- e) Provide on-job training.
- f) Indicate next service date for instrument.
- g) Be able to handle semi-solid samples.
- h) Sensitivity for size <0.45 micron.
- i) Provide spares and /consumables, and calibration standards:

Spares/Consumables	Quantity
PSA Package Professional	1 Package
Particle size standard PS415 (10-100 µm)	2 packages
Workstation with monitor	1
PSA Cleaning strips for measurement cell liquid (1 pack = 50 pieces)	5 Packs
PSA vacuum cleaner (230 Volts)	1
IDG air dryer (with Modular Compact Rheometer) with air filter unit	1 Package
Water filter kit PSA Supply	1 Package

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3.1.1.1 Technical Specification:

Number of lasers	2
Liquid dispersion technique	2 peristaltic pumps, ultrasound generator & stirrer.
Warm up time	1 minute
Measuring range in liquid mode	0.04 – 500 µm
Measuring principle	Laser diffraction
Repeatability	better than ± 1 % based on certified reference material
Accuracy	better than ± 3 % based on certified reference material
Measurement duration	< 1 min
Ambient temperature range	15-30 °C
Humidity	35-80 non-condensing

3.1.2 ICP OES

- a) Provide a ICP OES instrument and install all hardware components including tubing, electric cables, and software
- b) Set up to software to employer desired requirements (must be set up to employer requirements)
- c) Connect all gas lines as per the instrument requirements.
- d) Calibrate the instrument, provide calibration certificate and calibration standards.
- e) Test-run the instrument.
- f) Provide on-job training for operating and troubleshooting.
- g) Able to add methods on future required parameters.
- h) Be able to measure multiple elements of samples at low ppb and high ppm range.
- i) Provide applicable spares and consumables

Spares/Consumable	Quantity
Torch	2
Spray Chamber	1
Injector	2
Nebulizer	2
Peristaltic pump tubes	10

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3.1.2.1 Technical Specifications:

ICP-OES	Wavelength range	Full wavelength range with Charge Coupled Device detector
	Argon consumption	9 L/min
	Start up	10 min from power on
	Plasma	Dual view
	Monochromator	Double monochromator optical system
	Detector	Charge Coupled Device photon detector
	RF Generator	40MHz, free-running solid-state adjustable from 1000-1500 watts.
	Safety Interlocks	Automated
	Plasma ignition and extinction	Computer-controlled and automatic.
	Peristaltic pump	4-channelled, computer-controlled pump
ICP Chiller	Pump pressure	3.8-6.9 bar
	Pump Flow	13.2 litres per minute
	Cooling capacity @20 °C	2650 watts on 50Hz ;2900 watts on 60Hz
	Temperature controller	Microprocessor-based
	Sound measurements @ 1 meter away	65 dBA (full load),62 dBA (No load)
	Electrical requirements	50Hz :240 Volts ,60Hz :230Volts
Computer	Computer Monitor	LCD monitor 24 inches, 16:9 aspect ratio
	Computer tower	32 GB memory, with 3.0 USB hub and network card
Autosampler	Autosampler	3 rack, dual rinse, 60 position rack

3.2 Commissioning

- a) Test all pipelines and connections and software systems on completion for functionality and provide commissioning reports.

3.3 Transportation

Appropriate container and transportation equipment must be utilised for this purpose to ensure proper care and safety.

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3.4 Required instruments

No	REPLACE/ REFURBISH	COMPONENT DESCRIPTION	COMPONENT / MATERIAL SPECIFICATION	OPERATING PARAMETERS	PART / NUMBER	STOCK NUMBER	REQUIRED QUANTITY
	New	Particle Size Analyser	Benchtop	See Section 3.1.1			1
	New	ICP-OES	Benchtop	See Section 3.1.2			1

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Bongumusa Bungane	Chemical Services Manager
Evans Ramabina	Snr Chemist Chemistry
Bongani Ndala	Snr Supervisor Tech Laboratory
Philile Mpemvu	Snr Technician Chemistry

5. Revisions

Date	Rev.	Compiler	Remarks
June 2023	1	ZG Masilela	First Issue

6. Development Team

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

- Philile Mpemvu
- Richard Tjiana
- Bongani Ndala

7. Acknowledgements

- Not Applicable

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