Eskom	Works Information	Kusile Power Station

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Content

1. Introduction

The third party process control systems at Kusile Power Station are implemented mainly by means of PLC Systems. Kusile Power Station has several third party control system equipment situated at various plant areas. PLC control systems require stringent and regular maintenance to guarantee effective operation and optimum life cycle. There is currently no preventative maintenance carried out on third party PLC systems due to lack of training for Kusile Power Station Generation personnel. To ensure reliable performance of the third party PLC systems, training and maintenance support is required.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The objective of the works information is to provide a scope of work for providing training that will enable Kusile Power Station Personnel to effectively maintain PLC based control systems and support in case of emergencies and to perform periodic maintenance task for a period of five years.

The works must include but not be limited to:

a) Develop a training curriculum for Kusile Power Station specific requirements.

b) Train Kusile Power Station personnel on the Kusile approved customised training.

c) Support Kusile Power Station personnel with PLC system overwrite for configured users.

d) Support Kusile Power Station personnel with PLC system configuration backups.

e) Support Kusile Power Station personnel with PLC system preventative maintenance tasks and emergencies.

2.1.2 Applicability

This document shall apply to Kusile Power Station.

2.1.3 Effective date

September 2019

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] ISO 9001 Quality Management Systems.

[3] 240-55410927: Cyber Security Standard for Operational Technology.

[4] 240-149173297: Kusile Power Station Maintenance Execution Strategy for Third Party Control Systems.

2.2.2 Informative

[4] 240-91479924: Cyber Security Configuration Guideline of Networking Equipment for Operational Technology

[5] 204-53114002: Engineering Change Management Procedure

2.3 Definitions

Term	Definition
Contractor	Service provider contracted for supplying specific service to Eskom, Kusile Power Station.
Employer	Any person appointed in writing by Eskom as the delegated *Employer* in terms of the provisions of the Act, (normally the Power Station Manager)
KKS	Is a code used to clearly identify systems and components in a power plant according to process functions, points of installations and structures. "Kraftwerk-Kennzeichen-System (KKS)"
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.
Controlled Disclosure	Controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Explanation
C&I	Control and Instrumentation
GUI	Graphical User Interface
Gx	Generation
HMI	Human Machine Interface
ISO	International Organisation for Standardisation
OEM	Original Equipment Manufacturer

Abbreviation	Explanation
OS	Operating System
OTS	Operating Technical Specification
PLC	Programmable Logic Controller
QMS	Quality Management System
VDSS	Vendor Documentation Submittal Schedule

2.5 Roles and Responsibilities

2.5.1 System Engineers

a) Shall notify Operating Support of any changes to the Operating Technical Specifications.

b) Shall be responsible for updating the OTS as per recommendations from the Operating Support.

2.5.2 Engineering Manager

a) Originator of the required capability

2.5.3 Shift Managers

a) Shall ensure that the plant is run or operated according to the Operating Technical Specifications.

b) Shall ensure that any deviations from the specifications have been approved accordingly.

2.5.4 Operating Support

a) Shall be responsible for providing system engineers with information regarding required changes to OTS.

b) Operating support shall conduct internal audits at planned intervals to determine whether the OTS system conforms to requirements and is effectively implemented and maintained.

2.5.5 Training manager

a) Shall be responsible for reviewing the content of the training proposed by the *Contractor.*

b) Evaluate the training offered by the *Contractor*.

2.6 Process for Monitoring

The Monthly Plant Maintenance Performance report, compiled by the *Contractor* with assistance from the *Employer*, shall be used to track and assess the Contractor performance and effectiveness of their contract deliverables.

Furthermore, the effectiveness of the SD&L Implementation Progress and Skills Transfer to Eskom Employees (as well as others where applicable) shall also be monitored.

2.7 Related/Supporting Documents

N/A.

3. Scope of Work

3.1 Employer's design

3.1.1. Description

The current design of Kusile Power Plant constitutes of various PLC brands and Kusile personnel do not have the capability to maintain PLC systems. This Works Information describes the requirements for training on all types of PLC systems installed at Kusile Power Station, two field laptops for PLC Maintenance which would be supplied and handed over to Generation by the *Contractor* after contract acceptance. These laptops will be used for the required maintenance for these PLC systems.

The PLC third party systems are used as stand-alone control systems for various applications such as coal stockyard machines, 10-year ash dump machines, fabric filter pulsing systems, diesel generator, low pressure bypass, high pressure bypass, sewage treatment plant, and extraction fan control. The Kusile PLC installation Base includes the following PLC Systems as listed in the **Annexure** of this document**:**

a) Siemens S7-300
b) Siemens S7-400
c) Siemens S7-200
d) ABB PM564
e) Schneider Modicon M168
f) Allen-Bradley 1769 CompactLogix
g) Automated Logic ME-LGR25
h) Omron CPM1A
i) PRO-FACE LT3301-L1-D24-C
j) Siemens S7-1200
k) Siemens S7-1500

l) ADEC 2000

m) Siemens Logo

n) WAGO 750-8212

Eskom requires that the considered supplier shall as a minimum, provide the following:

a) The *Contractor* shall provide proof of competence and proof of OEM agent or partner registration.

b) Provide PLC training curriculum stating accredited and non-accredited training for all PLC systems installed at Kusile Power Station.

c) Provide hands on training at Kusile power station using the provided field laptops.

d) Provide PLC basic training, intermediate training, and advanced training covering the following topics as a minimum:

- Fundamentals of PLC hardware.
- Fundamentals of PLC software.
- Using ladder logic, statement list, soft logic, and function blocks.
- Using registers.
- Good programming habits.
- Good installation practice.
- Configuration and setup of Local Control Human machine interfaces.
- Advanced PLC Controls.
- Batch processes and sequential control.
- PID Control.
- Safety programmable systems.
- Industrial communications with focus on Profibus, Modbus, RS-232, RS-485 interfaces, and modems.
- PLC network security.
- Troubleshooting and maintenance.
- PLC fail safe programming.
- PLC system commissioning, testing, and upgrading.
- PLC administration (Backups, disaster recovery, and configuration).

e) The *Contractor* shall enter into a PLC maintenance contract for a period of five years and shall honour the contract as and when required. The *Contractor* shall be required to respond to emergency callouts within a four hour time line.

3.2 Work to be performed by the Contractor in delivering the works

3.2.1 Health and safety risk management

The *Contractor* complies with the Occupational Health and Safety Act Number 85 of 1993 and its regulations, *Employer*'s SHEQ Policy, Standards, Procedures, Guidelines, Specifications and Regulations.

The *Contractor* ensures safety awareness at all times through continuous training.

The *Contractor* must at all times be responsible for the supervision of his employees, agents and sub-*Contractor*s, and takes full responsibility and accountability in ensuring that they are competent, compliant and aware of the legal requirements and other applicable requirements, and executes the works accordingly.

The *Contractor* ensures that all statutory appointments, and appointments required by any *Employer*'s Policy, standard and Procedure, are recorded in writing and that all its appointees and/or agents fully understand their responsibilities and are trained and competent to execute their duties.

The *Employer's Project Manager*, or any person appointed by the *Employer's Project Manager*, may at any stage during the term of the contract:

- Conduct health and safety audits by a competent person regarding all aspects of compliance with the SHEQ requirements, at any off-Site place of work, or the Site establishment of the *Contractor.*
- Refuse any employee, sub-*Contractor* or agent of the *Contractor* access to the premises if such person has been found to commit an unsafe act or if any work is found not to be compliant or authorized.
- Issue the *Contractor* with a STOP WORK ORDER should the *Employer's Project Manager* become aware of any unsafe working procedure or condition, or any non-compliance.

The *Contractor* immediately reports all incidents as well as any threat to safety and health of which the *Contractor* becomes aware at the Site, to the *Employer's Project Manager*.

The *Contractor* agrees that the *Employer* is relieved of any and all of its responsibilities and liabilities in terms of the Occupational Health and Safety Act no 85 of 1993 in respect of any acts or omissions of the *Contractor*, and the *Contractor's* employees, agents or sub-*Contractor*s, to the extent permitted by the Occupational Health and Safety Act no 85 of 1993.

The *Contractor* provides a health and safety plan based on the *Employer's* Safety, Health and Environmental Specification.

All persons entering the Site must undergo the *Employer's* safety induction course.

The designer of the works is mandated to comply with section 6 of the construction regulation 2014.

3.2.1.1 Safety of Worker

The *Contractor* is to ensure the safety of all persons working on the Site.

Any hot work, including welding, will be applied for in accordance with the permit to work system.

No hot work will be allowed on Site unless a hot work permit is granted in writing.

Precautions must be taken to prevent any objects, welding or grinding sparks from falling beyond the immediate working area.

Ear protection and all required PPE must be provided to all personnel by the *Contractor*.

The *Contractor* completes activity risk based assessments and provides the assessments to the *Project Manager* for acceptance before activities take place.

3.2.1.2 Fire Protection

The *Contractor* must ensure that his employees are trained in the use of firefighting apparatus.

The *Contractor* must take precautions to prevent any occurrence of fires or explosions while carrying out any work near flammable gas and liquid systems. Any tampering with the *Employer's* fire equipment is strictly forbidden. All exit doors, fire escape routes, walkways, stairways, stair landings and access to electrical distribution boards must be kept free of obstruction, and must not be used for work or storage at any time. Firefighting equipment must remain accessible at all times.

In case of a fire, the *Contractor* must immediately report the location and extent of the fire to the Electrical Operating Desk using the station's Emergency Number. The *Contractor* must take the necessary action to safeguard the area to prevent injury and spreading of the fire.

3.2.1.3 First aid

The *Contractor* provides First Aid services (level 2) to his employees and sub-*Contractor*s. In the case of severe or serious injury, to his employees and sub-*Contractor*s the *Employer's* Medical Centre and facilities will be made available and accessible to such persons.

3.2.1.4 Housekeeping

It is the *Contractors* responsibility to ensure that the Site is cleaned daily. All electrical cables and hoses are routed so as not to cross unprotected over floors and walkways. All equipment is packed neatly without interference to access. All excess scaffolding material is removed from Site after the scaffolding has been erected. The *Contractor* is responsible for the removal of any scrap material to the designated scrap area on a daily basis.

3.2.1.5 Barricading

Access to danger zones is restricted using handrail type guards at least 1.2 meters high and able to block access to the danger zone. Red tape is not allowed. Symbolic safety signs depicting 'Danger', name of *Contractor*, Responsible Supervisor, Contact details of supervisor and 'No entry' are attached to the guards. This includes access during the taking of X-rays.

3.2.1.6 Radiographic Examinations

When radiographic tests are carried out in the plant by Others, the danger area is evacuated with the exception only of authorized radiographic workers, and thereafter barricaded. To ensure that employees and contract staff working in *Employer's* premises are not exposed to more radiation than is reasonable level, the *Contractor* complies with the Kusile Power Station procedure 'Requirements and Rules for Radiation Protection and Safety of Radiation Sources'.

3.2.1.7 Permit to Work System

The *Contractor* allocates personnel to be trained and authorised as Responsible Persons according to *Employer's* Plant Safety Regulations (36-681). The *Contractor* ensures that adequate number of appointed Responsible Persons and Authorised Supervisors prior to the outage date or commencement of work at the station. The *Contractor* ensures that Responsible Persons and Authorised Supervisors are available on Site at all times during the execution of the Work.

If the *Contractor* breaches this obligation, the *Employer's Project Manager* withholds monthly payments until the *Contractor* complies with this obligation.

3.2.2 Information Technology Functional Requirements

3.2.2.1 Special Tools Requirements

The *Contractor* shall provide two field laptops configured with all software required for Kusile Power Station PLC installation base diagnostics and configuration software.

3.2.2.2 Cyber Security

The *Contractor* shall review the Eskom standard on Cyber Security - 240-55410927 and will identify relevant areas applicable for the Works and confirms his compliance to the relevant areas to the Eskom Standard. The *Contractor's* representatives to work on the maintenance support contract shall be subjected to the *Employer's* vetting process. *Contractor* shall provide cyber security proof of training for representatives who will be working under the contract to be established with the *Employer.*

3.2.2.3 Software Configuration

The *Contractor* installs all required software to meet the functional requirements of the diagnostic and monitoring system as described in the Works Information.

Installation software required to recover the system in the event of a failure are provided to the *Employer*. The software is categorised per installation and software licences are clearly defined.

3.2.2.4 Support - Hardware / Software / Backups

It is of the utmost importance to ensure the reliability of the backup system. The system must be tested at least every 6 months and any test failures must be reported to management.

In normal situations any file, workspace or database must be recovered in less than 2 hours. If the time to recover a file exceeds 4 hours, the backup philosophy will be improved and updated.

3.2.2.5 Licencing

1) All licenses covering the equipment, standard software and application software provided are included as part of the Works.
2) All licenses remain valid in the event of the failure and replacement of faulty equipment
3) All licenses are site licenses for use at the specific site.
4) Installation disks are provided for all licensed software provided.
5) Upgrades of software and the associated licenses are provided throughout the duration of the works up to the completion of the last sectional completion.
6) The software provided is the latest revision of the software as and when the final installation is completed.
7) All software patches, bug fixes, virus updates and software upgrades for the systems are provided throughout the duration of the *works*.

3.2.3 Training Requirements

The *Contractor* provides three training sessions for each of the trainings (Basic, Intermediate, Advanced) to be held at venue provided by the *Employer*. The training software is official OEM certified training. The *Contractor* provides the *Employer* with the items included in the training for the acceptance of the Project Manager.

a) The language for training facilitation as well as documentation is English and includes all third party documentation from any sub contracted trainer.
b) The *Contractor* compiles training manuals for official training courses.
c) Printed and electronic copies of the training documentation shall be supplied for each trainee plus an additional 2 hardcopy master sets and soft copies of each set of training manuals.
d) All training documentation provided by the *Contractor* shall be customised for Kusile Power Station.
e) The training documentation shall contain the specific PLC systems' equipment installation, and architecture.

3.2.4 Documentation

The *Contractor* is responsible to plan for the supply of the documentation for the training.

3.2.4.1 Documentation control

All documents and records management are performed according to Technical Document and Record Management Work Instruction (240-76992014), Gx Projects Documentation Deliverable Requirements Specification (240-65459834) and Engineering Drawing Standard – Common Requirements (240-86973501) and the *Project Manager* ensures that the *Contractor* is provided with latest revisions.

Any uncertainty regarding all specified documents should be clarified with the *Project/Training Manager* and clarification updates should be reflected in updated versions of these documents.

The *Contractor* complies with all minimum document metadata as specified in Smart plant Owner Operator Technical Documentation Metadata Standard (240-54179170).

3.2.4.2 Documentation Pre-submission (VDSS)

The *Project Manager* will compile and provide the Vendor Documentation Submittal Schedule (VDSS) to the *Contractor* as part of the enquiry package. The VDSS will list minimum documentation deliverables for the work to be done as per the Works Information.

The *Contractor* upon receiving the VDSS must review it and ensure that the delivery dates of documentation are linked with the completion of work as per the activities in the programme. After review, the VDSS will then be submitted by the *Contractor* to the *Project Manager* for review and acceptance. Should the programme be revised and affect documentation deliverable dates, the updated VDSS must be submitted as per the revised programme.

3.2.4.3 Process for Documentation Submission

All documentation submitted must be accompanied by the completed transmittal with the following fields as a minimum:

a) Name of *Contractor*
b) Transmittal Number
c) *Contractor* Details
d) Date of Submission
e) Description of Document
f) Document Number
g) Document revision
h) Document type
i) Document media type
j) Number of copies
k) Signed by and date

Final documentation is submitted in both electronic and hard copies to the *Employer's Project/Training Manager*. The *Contractor* adheres to one soft copy in a compact disc and one hard copy per station.

3.2.4.4 Documentation Recording

The *Contractor* develops; list and maintains the Master Document List (MDL) of all documents submitted to the Project/*Training Manager* with all the relevant metadata.

3.2.4.5 Documentation Review and Turn-around

The Project/*Training Manager* has a maximum seven (7) working days to review and consolidate review comments for documentation submitted by *the Contractor*. The *Contractor* also has a maximum of seven (7) working days to respond and / rectify as per the comments by the *Project/Training Manager.*

3.2.5 Quality Management

The quality requirements are as per ISO 9001:2008 and *Employer* Quality Standard, QM 58. This quality management philosophy is developed from the basis that manufacturers produce quality products, supervisor oversees the process, checks quality but liability for quality remains with the *Contractor*. The *Contractor* submits a QMS as a returnable schedule and uses it for all phases of the Project. The QMS complies with the requirements of ISO 9001:2008 standard. The *Contractor* provides evidence of a fully implemented QMS as and when requested by the *Project manager*. The *Project Manager* may at his sole discretion carry out an audit on the *Contractor*, the *Contractor*'s suppliers and Sub-*Contractor*s

Quality control plans will be produced by the *Contractor* or manufacturer which will indicate the level of product quality control to be applied. The CQP must be aligned to, and reference ISO 10005:2005 QMS, guidelines for quality plans and in compliance with the guideline in 240-105658000. The CQP will make reference to the *Contractor's* QMS Procedures to be used in this Contract. This plan will be reviewed by the *Project Manager*. The project team monitors that these plans are being implemented and that it is yielding the expected results through process and product verifications.

High quality standards are also assured by conforming to the following:

a) The use of sound design and engineering principles,
b) The design process uses a good performance and functional specification,
c) It is ensured that the installation conforms to the Works Information.
d) Design Review Procedure is followed
e) Engineering Change Procedure
f) QA/QC on project (manufacturing, installation)

The *Contractor* submits the following documents within ten (10) working days of the Contract Date to the *Project Manager* for review and acceptance prior to the commencement of work:

a) The *Contractor's* QMS compliance with the requirements of ISO 9001:2008
b) *Contractor's* quality manual
c) *Contractor's* quality procedures
d) *Contractor's* quality forms and work instructions

e) *Contractor's* quality system documents referenced in this Works Information

The *Contractor* supplies the *Project Manager* with a QCP or ITP for review and acceptance.

The *Contractor* supplies the *Project Manager* with a detailed contractor organogram showing the quality personnel to be used in the Contract. The *Contractor* provides CVs of the quality management employees who will be responsible for quality.

The *Contractor's* Quality Management employee's responsibilities include but are not limited to the following:

a) Implementation of the QMS
b) Administration of QA/QC systems
c) Verification of approval status of Sub-*Contractor*'s QCP and procedures
d) On-and -offsite inspections
e) Co-ordination, inspection and verification of the *Employer's* intervention points
f) Review of *Contractor* testing and inspection documents (procedures, test results)

- Reporting on quality performance

The requirement to submit these documents does not constitute a compensation event.

3.2.5.1 Quality Responsibility

a) The *Contractor* is accountable for the quality of the output and liable for any failures.
b) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections. These are in line with the *Employers* requirements.
c) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections to be imposed on his Sub-*Contractor*'s, suppliers and sub-suppliers and must ensure that these are in line with the *Employer*'s requirements.
d) The intervention requirements take into consideration the criticality of the Plant and Material.
e) The intervention points include all witness, hold, verification and review points required by the *Employer*. The *Contractor's* failure to allow the intervention points will constitute a non-conformance.

3.2.5.2 Non Conformances and Defects

Where NCR's and Defect notifications are issued, the *Contractor* acknowledges receipt within 48 hours and proposes corrective and preventive actions to the *Project Manager* as per the contract response period. The corrective and preventive actions will include the implementation and completion dates. Progress on all NCR's and Defect notifications issued to the *Contractor* must be reported to the *Project Manager* on monthly basis.

The *Contractor's* Quality Manager keeps a register of all NCR's and Defect notifications issued. Deviations from the Contract are treated as a non-conformance. Records of NCRs and Defect notifications are kept and form part of the data book records.

During the contract execution phase, the *Contractor* will be monitored by the *Project Manager* for performance on quality related aspects. The monitoring will be in the form of audits and assessments.

3.2.5.3 Tests and Inspections before Delivery

It is the responsibility of the Contractor to ensure that the system is tested after installation/restoration to the satisfaction of the Employer's data quality requirements.

3.2.5.4 Maintenance Support performance requirements

The performance of the *contractor's* maintenance support shall be assessed on a monthly basis by the *Employer*. The key performance indicators shall be the following:

a) Availability of PLC systems

b) Knowledge transfer to the *Employer's* representatives.

c) Response time – the *contractor* shall respond to an emergency within 4 hours.

d) Execution of preventative maintenance tasks.

3.3 Parts of the *works* which the *Contractor* is to perform

The *Contractor* shall carry out, compile at Kusile specific Training for PLC systems installation base. However the appointed *Employer's* representatives will be required to work in close collaboration with the *Contractor* and assume overall responsibility on behalf of the *Employer for all activities carried out for the PLC systems maintenance support*.

a) Provide on the job training for the *Employer*'s representatives for trouble shooting during call outs.

b) Work with the *Employer*'s representatives to delete created user on each PLC and create *Employer*'s provided users and passwords.

c) Work with the *Employer*'s representatives to create backups for each PLC following the *Employer*'s backup schedule.

d) Work with the *Employer*'s representatives to update firmware patches provided by the PLC OEM without affecting the operations of the PLC.

3.3.1 Procedure for submission and acceptance of *Contractor's* design

The *Contractor* shall meet requirements specified in section 3.2 of this Works Information. The *Contractor* shall confirm compliance to the specified training requirements as well as provide the training manuals for review to the Project/Training Manager. The reports and all documentation shall meet the quality standards specified in sections 2.2 and 2.6 of the ISO 9001, Quality Management Systems [1].

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Puseletso Ndlovu	C&I Engineering Manager
Fulufhelo Netshiongolwe	Engineering Manager
Thabo Thwala	Training Manager
Stanley Mathye	C&I Maintenance Manager
	Technical Plant Manager

5. Revisions

Date	Rev.	Compiler	Remarks
September 2019	1	H.B Marobane	This document was compiled to provide requirements for the Kusile Power Station PLC System Training and Maintenance Support
October 2021	2	H.B. Marobane	Second Issue
November 2024	3	G.T Nyathi	Third Issue
October 2025	4	G.T Nyathi	This document was modified to provide requirements for the Kusile Power Station PLC System Training and Maintenance Support.

6. Development Team

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

- Harold Marobane
- Mauritz van der Bank
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- Michael Hambly
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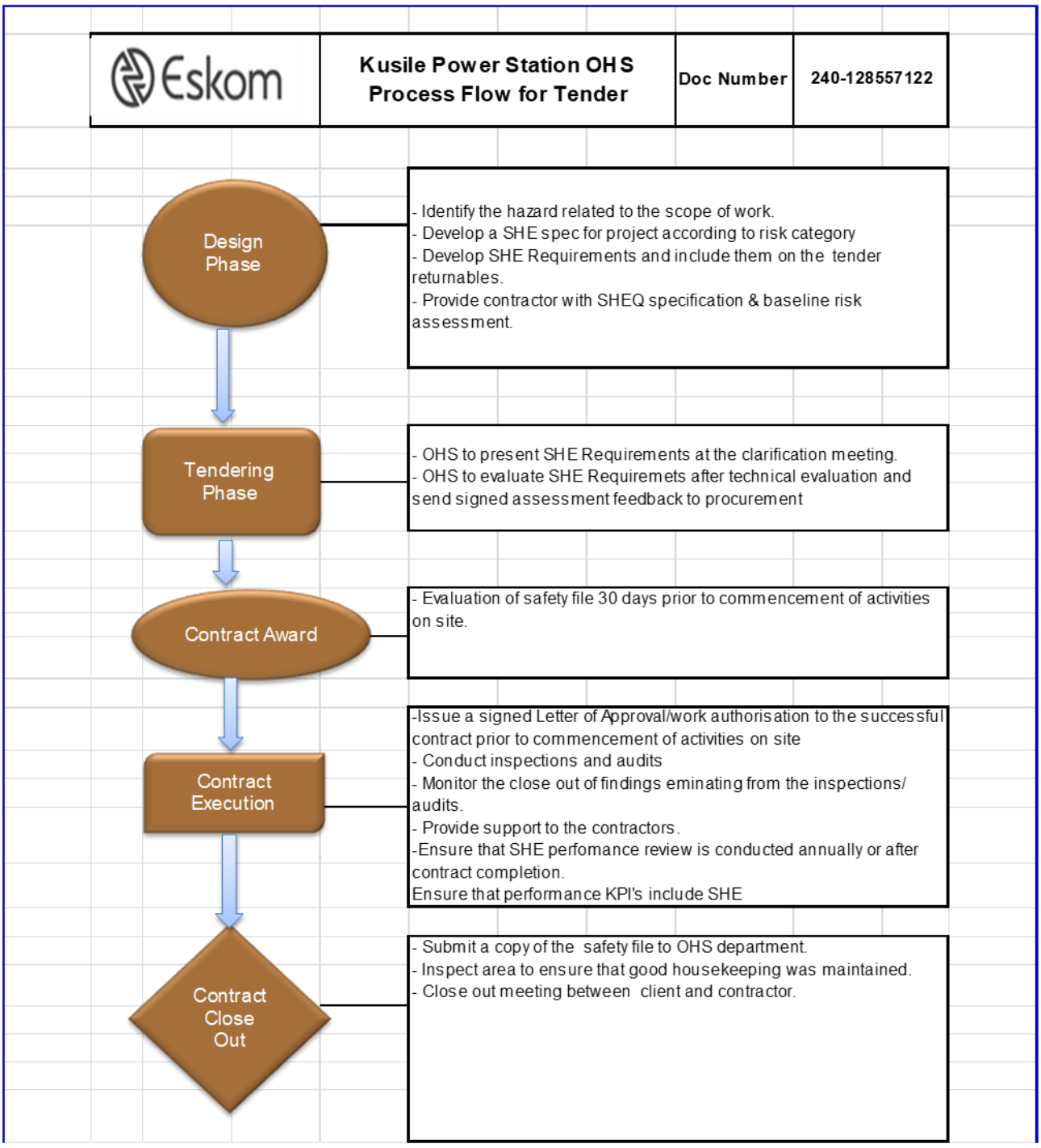
7. Acknowledgements

Paul Du Plessis

Appendix A – Kusile Power Station OHS Process Flow for Tender



8. Annexure – PLC Installation Numbers

OEM	Number of installations
Siemens S7	101
Allen-Bradley 1769 - FWP	18
Schneider Modicon M168	5
Automated Logic ME-LGR25	5
Omron CPM1A	6
PRO-FACE LT3301-L1-D24-C	7
ADEC 2000	3