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1. INTRODUCTION

A Plant Information System (PIS) in a Medupi Power Station allows near real-time and historical plant information to be available to users and other software applications. It provides a common and consistent source of data, which is used for monitoring the plant and analysing plant performance. This includes data generated by all process control systems, as well as any other relevant plant data from other sources.

The PIS performs short term storage, long term storage and archiving of process information for the life of the Power Station. A central Process Historian is provided by the PIS for the storage of all relevant plant process information produced at the Power Station. In addition, the system is also used for remote access and retrieval of plant information by users via an interface from a Station Office LAN, and to link to other information system applications on the Station Office LAN

This document contains information regarding the need to replace the current General Electric and the Siemens Plant Information System being used at Medupi Power Station and the requirements for the replacement to take place. The Plant Information System used at Medupi for Unit 4 – 6, Station Electrical Reticulation (SER) and Balance of Plant (BOP) is the GE PIS (Previously Alstom) while for Unit 3 – 1 is the Siemens PIS. Through the commissioning of the GE PIS various issues were found and needed to be addressed and some of the Siemen's PIS.

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope of the project shall include decommissioning both the GE and the Siemens PIS, procurement of an alternative reliable single PIS, engineering of the new PIS, Installation, and commissioning of the whole works.

The work shall include:

- All Units
- BOP and SER
- Interface Systems
- Accuracy of the design documentation

2.1.1 Purpose

The purpose of this SoW is to outline and describe the Plant Information System's technical and operational requirements for the proposed Plant Information System's Replacement, to identify risks and constraints and to identify critical stakeholders and to provide technical content in support of engineering work requests.

This change is necessary to address the current challenges faced with the frequent unavailability of the plant information system.

2.1.2 Applicability

This document is applicable to Medupi Power Station to lead a multi-disciplinary team for the development of the project for the PIS Replacement.

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] 240 – 53114002 Engineering Change Management Procedure

[2] GGPP 0592 Power Station Plant Classification Policy

[3] 240-56227589 List of Approved Electronic Devices to be Used on Eskom Power Stations Standards

[4] 32-351 Network Security

[5] 32-372 Physical and Environmental Security

[6] 32-894 Sever Room and Data Centre Standard

[7] 240-56355910 Management of Plant Software Standards

[8] 32-85 Information Security Policy

2.2.2 Informative

[9] MED/90/W/--------DC/SD/001 - ALSPA CONTROPLANT DCS BOP Architecture

[10] MED/00/W/--------DC/SD/002 – ALSPA CONTROPLANT DCS Simplified Network Architecture

[11] MED/00/D/--------PI/LM/001 - Plant Information System Tag Database

[12] MED/00/D/--------PI/FT/001 - Plant Information System Report Templates

[13] MED/00/W/--------DC/DS/003 - ALSPA CONTROPLANT DCS HMI Product Data Sheets

[14] MED/00/W/--------DC/DS/002 - ALSPA CONTROPLANT DCS Network Product Data Sheets

[15] MED/00/D/--------DC/GS/008 - Network Monitoring Functional Specification

[16] MED/90/W/--------DC/IT/003 - ALSPA CONTROPLANT DCS - BOP Network and Control Equipment Schedule

[17] MED/00/D/--------PR/NA/001 - ALSPA CONTROPLANT DCS - HMI Principles

[18] MED/00/D/--------DC/MM/004 - ALSPA CONTROPLANT - PIS Update Guideline.

[19] MED_GFR-020C04030-EDC-201678-en-C – ALSPA Control System Optiplant PIS

[20] MED-P17_00_GFG09_EDB070-164_App01 - Installation User Manual

[21] MED-P17_00_GFG09_EDB070-164_App02 - PIS Database Large Data Export Procedure

[22] MED-P17_00_GFG09_EDB070-164_App03 - PIS Editing on SPPA-T3000 Engineering Stations

[23] MED-P17C_00_GFG09_EDB070 164 – PIS SYSTEM FUNCTIONAL SPECIFICATION A03

[24] MED-P17C_00_GFG02_EFA010-162_OVERVIEW_NETWORK_ARCHITECTURE_DRAWING

[25] MED-P17C_00_GFG09_EDB070-162_BACKUP_SYSTEM_FUNCTIONAL_SPECIFICATION

[26] MED-P17C_00_GFG09_EDB070-157_GPS_TIME_SYNC_SYSTEM_FUNCTIONAL_SPECIFICATION

[27] MED-P17C_00_GFG01_EPF010-034_App11_PI-Data-Archive-System Management-Guide

2.3 DEFINITIONS

ALSPA HMI	ALSPA supervision system
Balance of Plant	All plant and equipment that does not fall under the Power Island areas, including the station electrical reticulation, LPS, WTP, Coal & Ash
Cluster	Microsoft software component available in Windows Server 2008. Two types of clusters are available: High-Availability Cluster: for services / applications redundancy (ex: Microsoft SQL Server database manager) Network Load Balancing Cluster: for Web server redundancy and load balancing between several Web servers (ex: Microsoft IIS)
CONTROCAD	ALSPA engineering tool
CONTROPLANT	ALSPA system including automation cells, CONTROCAD engineering tool, ALSPA HMI software and stations
Ethernet Enterprise Bus	Ethernet network of ALSPA CONTROPLANT system for commissioning and maintenance activities, office automation activities (printers, Internet access, …), communications between CONTROPLANT and OPTIPLANT
Ethernet Process Bus	Ethernet network of ALSPA CONTROPLANT system for communications between automation cells and ALSPA HMI stations and for intra-communications between ALSPA HMI stations.
Historian Server	ALSPA HMI server containing historical data (samples, alarms/events, statistical data)
Hot-swappable	The capability of being able to disconnect and connect devices while the computer or other device is in operation, energised, and have those devices detected without having to boot the computer or device
iSCSI	SCSI communication protocol based on Ethernet TCP/IP for high throughput connection between machine and data storage device (ex: SAN)
Near Real-time Data	Data that is updated on a display within 30 seconds of a change in its value
Plant Information System (PIS)	ALSPA Energy Management Solution, providing support decision support applications to optimize electricity production efficiency, improving plant availability and production efficiency
OPTIPLANT	OPTIPLANT is the main software used for Human Machine Interface (HMI) and Management of PIS
OPTIPLANT Data Center	OPTIPLANT server component hosting OPTIPLANT database (configuration data, historical data) based on Microsoft SQL Server
OPTIPLANT Front-end server (or Web server)	OPTIPLANT server component hosting OPTIPLANT Web server based on SharePoint server and executing optional OPTIPLANT applications (ex: Plant scheduling, Plant performance)
PIS Client	A computer on the Station Business LAN, which is using the Microsoft Windows XP or later operating system and any process computer on the process communication bus

PIS OPC Client	The PIS OPC client is the software part of the PIS server to enable connection with RTCS OPC server.
PIS Database	The database on the PIS Data Servers that stores the plant information
PIS Data Servers	The servers that store the historical plant information for Medupi Power Station
PIS Dual Link	Point-to-point network for PIS servers monitoring
PIS Navigation View	View in PIS Web portal for navigating through Plant level and Unit level (Power Islands and BOP)
PIS LAN	PIS LAN is a Hirschmann optical hyper ring based on 1 Gbits/sec RS30 managed switches.
PIS Zones	PIS zones shall be defined to restrict PIS client access to specific data or PIS reports. They are defined in correspondence with CONTROPLANT zones.
Plant Browser	Browser in PIS Web portal for displaying and selecting variables to be displayed in Curve viewer
Power Island	Boiler, turbine, generator, cooling system, pulse jet fabric filter plant and including all auxiliary plant and systems associated with the Power Island.
Smart Calculation Engine (SCE)	Smart Calculation Engine includes a workshop, installed on CONTROCAD Server, and a real-time module, installed on PIS Data Servers. This tool is used to run calculation applications on PIS.
Storage Area Network (SAN)	A Storage Area Network is a dedicated storage network that provides access to consolidated, block level storage. SANs primarily are used to make storage devices (such as disk arrays) accessible to servers so that the devices appear as locally attached to the operating system (as ATA or iSCSI).
SharePoint Server	Microsoft software for Web application management system
Station Business LAN	Station-wide Local Area Network for access by the wider Medupi Power Station staff
NTP	Network Time Protocol: protocol for synchronising devices through Ethernet
NTP stratum	Stratum levels define the distance from the reference clock. A reference clock is a stratum-0 device that is assumed to be accurate and has little or no delay associated with it. A stratum-1 time server is directly linked (not over a network path) to the reference clock. It typically has less than 1 ms accuracy to the reference clock. A stratum-2-time server typically has 10-100 ms accuracy to the reference clock.
Real Time Core Server (RTCS)	ALSPA HMI server containing real time information (acquired data, calculated data, alarms/events)
Set or CONTROPLANT Zone	Attribute of variables, mimics (process graphics) and reports in ALSPA system. Several zones can be assigned to each variable or mimic from ControCad engineering tool and to each report from IMS configuration tool. The ALSPA system contains a maximum of 32 zones.
Global Repository	Database hosted in SAN, containing historic data for whole plant and Front-End server configuration data

2.4 CLASSIFICATION

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.2 ABBREVIATIONS & ACRONYMS

Abbreviation & Acronym	Description
ROC	Required Operational Capability
SRD	Stakeholders Requirements Definition
BOP	Balance Of Plant
CAL	Client Access License
DCS	Distributed Control System
DWS	Disturbance Worksheet
EWS	Event Worksheet
GPS	Global Positioning System
SDD	Solid State Drive
IIS	Internet Information Services
IMS	Information Management System: ALSPA reporting system
iSCSI	Internet Small Computer System Interface
LPS	Low Pressure Services
NTP	Network Time Protocol
OLE	Object Linking and Embedding
OPC (UA)	OLE for Process Control (Unified Architecture)
OPC (DA)	OLE for Process Control (Data Access)
PIS	Plant Information System
phBSig	Program Boolean signal
RWS	Raw Worksheet
SAN	Storage Area Network
SCE	Smart Calculation Engine
SER	Station Electrical Reticulation
SQL	Structured Query Language
SWS	Statistical Worksheet
UTM	Unified Threat Management
VM	Virtual Machine on PIS stations
VPN	Virtual Private Network
WCF	Windows Communication Foundation
WTP	Water Treatment Plant

2.5 ROLES AND RESPONSIBILITIES

Key Area	Roles and Responsibilities
C&I Engineering	Responsible for compilation of the SoW document to ensure that all the technical and operational requirements of the Plant Information System Replacement Project are adequately and effectively described in the SoW document. Control & Instrumentation Engineering also assumes the role of the client representative during the project lifecycle from inception to finalisation.
Gx C&I Engineering COE	Responsible for the review and authorisation of the designs involved in this Engineering Change. Accountable for the concept and basic design phases ensuring that proper Engineering process is followed. Also responsible for the review and supply of all necessary engineering documentations associated with the EC.
Design Review Team	Concurrence with the design review processes applied to the engineering design or engineering change. Ensuring that all design input has been adequately considered. In particular to ensure that the engineering change has been adequately reviewed with regard to interface issues between various disciplines, contractors etc.
EDWL	The role of the Lead Discipline Engineer is to manage the technical integrity of the design and be accountable for the management of the interfaces within their specific engineering domain. Ensure that governance is followed during the design leading up to implementation and commissioning. Facilitate and ensure continuous management of the requirements for system design
Engineering Practitioner	Ensures that the stakeholder requirements are translated into technical requirements against which the design of the asset/modification can be developed.
Project Manager	Responsible for the planning, contracting, and managing of the project. The project manager is appointed by the project sponsor to act as a single point of accountability for all development work/activities from project conception to the approval of the Execution Release Approval. The project manager is also responsible for finalisation phase of the project.
Project Engineering Manager	The project engineering manager oversees project engineering work including project engineering resources.
Outage	Plan the project execution schedule as per the submitted SOW. Ensure plant availability for decommissioning, installation, and commissioning of the system. Execute the works on the BOP and SER with proper planning, since it would be a live swap over, and proper planning is required with limited time that plant would be available.
Health, Safety and Environment	Provide assistance and/or guidance on all the applicable health, safety and environment regulation relating or that may be impacted by the implementation of this project.

2.6 PROCESS FOR MONITORING

This engineering change will follow the Engineering Change Management procedure. Thus,
- The specified engineering activities and effort will be reviewed and either approved or revised.
- Correct and adequate engineering processes, systems, tools, packages, and disciplines will be selected and specified.
- Weekly project management meetings to be held to provide feedback, with formalised agenda and official minutes kept for record purposes.
- The latest revision of the Eskom PLCM will be used for development and execution of the project. Changes to the SoW shall be managed in accordance with Project Engineering Change Procedure.

2.7 RELATED/SUPPORTING DOCUMENTS

- PIS Clarification Issues MED-P17-MoM-1038 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1047 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1012 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1017 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1020 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1021 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1043 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1044 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1045 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1010 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1011 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1013 (GE PIS)
- PIS Clarification Issues MED-P17-MoM-1016 (GE PIS)

3. SPECIFIC REQUIREMENTS

3.1 GENERAL SYSTEM DESCRIPTION

A Plant Information System (PIS) in Medupi Power Station allows near real-time and historical plant information to be available to users and other third-party software applications. It provides a common and consistent source of data, which is used for monitoring the plant and analysing plant performance. This includes data generated by all process control systems, as well as any other relevant plant data from other sources.

It stores plant information on 2 redundant PIS Data Servers. The PIS Data Servers archive all the plant information transmitted to and generated by the various control system servers and are used to supply information to all Clients connected on the Station Office LAN.

3.1.1 Main Functions

The PIS is a central database repository for the long-term storage of all plant information produced at Eskom Power Station. This includes:
- All plant information generated by the Distributed Control Systems (DCS),
- Other relevant control and instrumentation systems interfaced to the DCS (Examples include the Turbine Control & Protection System, Generator Condition Monitor, H2 Plant, N2 Plant, Water Treatment Plant, BOP, Chemistry Analyser Network, etc.),
- Other sources identified during the clarifications.
- The PIS also includes all modules for the analysis of all the plant information including:
  - Alarm data,
  - Sequence of Events (SOE),
  - Field and other system's readings (inputs and outputs),
  - Control and instrumentation system calculated variables, control variables, and system settings,
- Operator inputs (key logging).
- The system is also used for the remote access and retrieval of near real-time and historical plant information by the PIS Clients
- Reporting and production data verification
- The system also provides the function of replicating the mimics as is on the operator stations.

3.1.2 Functional Interfaces

The system interfaces with the existing interfaces but not limited to:

- **DCS (ALSPA DCS Series 6 & SPPA-T3000)**

- **Eskom LAN**

- **Third party applications through OPC communication**
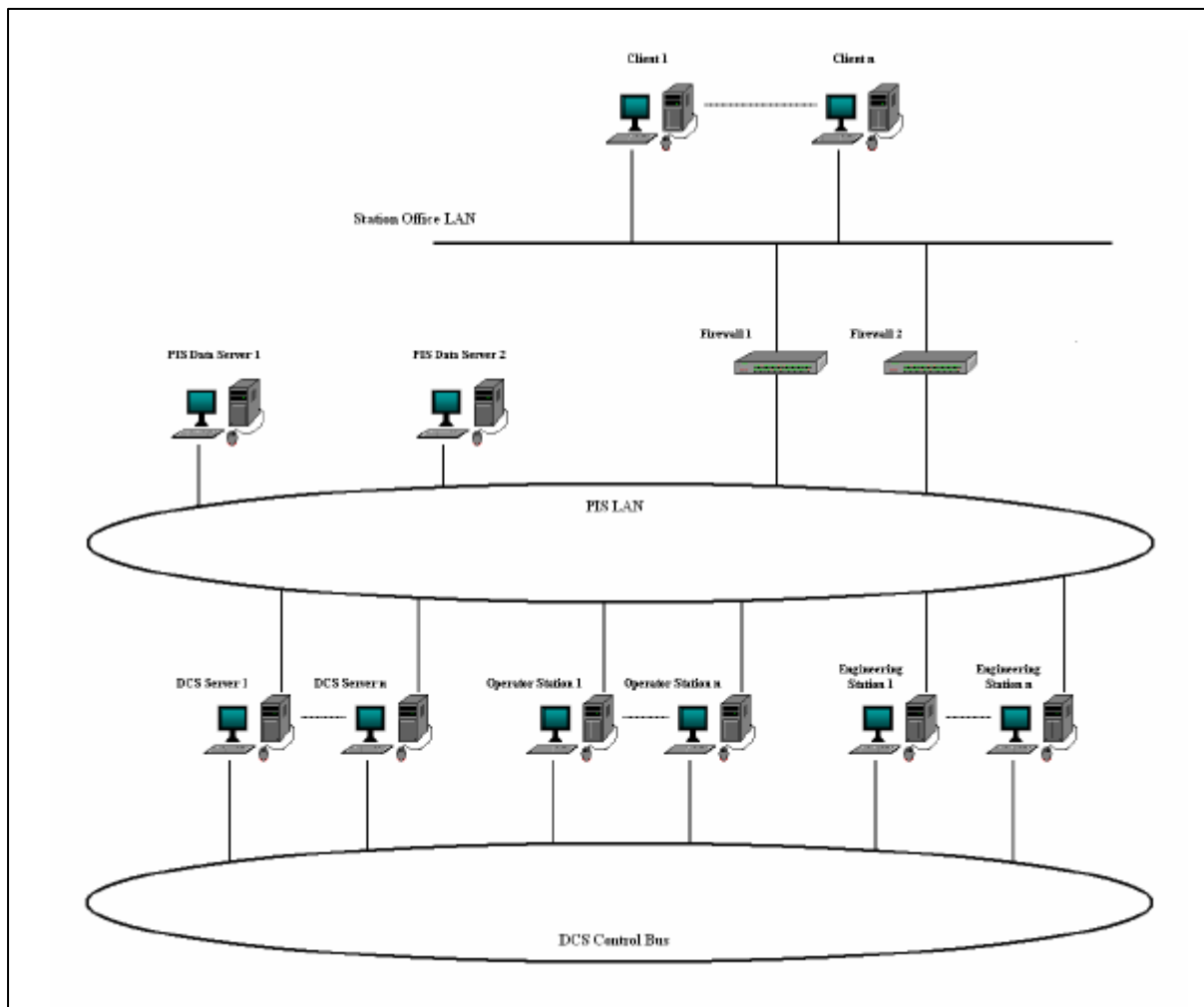
Figure 1: General Architecture of PIS and its interfaces.

3.2 Requirements

3.2.1 PLANT INFORMATION STORAGE

- The PIS shall store the plant information for all Power Islands and the Balance of Plant on fully redundant physically separated servers. The redundant PIS data server shall be physically separated from the control and instrumentation system servers. Engineering and diagnostic workstations and operator workstations and shall be provided by the Contractor as part of the Works. A one-million tag PIS licence shall be provided by the Contractor.

- The PIS shall store all data, including:
  - Alarm data (ability to run alarm KPI reports on all of the DCS rings, BOP, SER and Units 1-6.
    - Standing alarms
    - Alarm Floods / Rate
    - Chattering Alarms),
  - SOE,

- o Field and other system's readings (inputs and outputs),
- o Control and instrumentation system calculated variables,
- o Control and instrumentation system control variables,
- o Control and instrumentation system settings,
- o Operator inputs (key logging),
- o Analogue signal data,
- o Digital signal data.

- The PIS shall be able to store all analogue tags with a precision adjustable from 0,1% to 10,0% in the Historian. The average precision for all analogue tags together shall be 0,5%. All events shall be recorded upon state changes with a timestamp resolution and accuracy of 1 s or better. The PIS data servers shall store a minimum of 5 years of all historical plant information on-line at maximum resolution for access by the PIS clients. The PIS shall store all analogue, digital, calculated and control variables.

- The PIS shall be able to back-up the historical plant information stored on the PIS data servers to external hot-swappable SDDs automatically, while on-line and without any loss of availability and functionality of the PIS. External hot-swappable SDD's shall be supplied by the Contractor for 5 years of off-line data, as part of the Works. The PIS shall not lose any data even under the most extreme situation such as a multiple unit trip.

3.2.2 PIS CLIENT INTERFACE

The Contractor shall supply, as an integral part of the Works, web server software that allows the PIS clients, with the appropriate user rights and a standard Internet Browser as well as standalone software applications that can be installed locally on the PCs, to view all the real-time and historical plant information from the PIS in the form of:

- trends (y = f(t)),
- plots (y = f(x)),
- chronological lists,
- reports (automated that can be scheduled and sent via email / publish a link to download via email),
- reports,
- user customizable process graphics,
- user configurable trends and reports (to be setup for personalised standard trends),
- user friendly extraction of data by users,

The design and engineering of web pages that supply the real-time and historical plant information from the PIS to the PIS clients shall be provided. A minimum of 150 PIS clients shall be able to access all real-time and historical plant information from the PIS simultaneously.

3.2.3 ESKOM LAN INTERFACE

The Plant Information System shall connect to the station business LAN through a redundant firewall. The supplier shall provide the appropriate firewall, hardware/software to ensure proper operation and communication.

The Contractor shall install and supply all optic fiber cabling required connecting to the station business LAN and all necessary associated equipment such as connection boxes and switches. All bus cable jointing, splicing and termination forms part of the Works.

The Contractor shall assess the cable routes at site and provide full details for the Engineer's approval.

3.2.4 REDUNDANCY

The PIS data servers shall be fully redundant. In the event of a failure of one of the PIS data servers, the redundant PIS data server shall automatically take over its functions, without any loss in availability or functionality of the PIS. When the failed server is returned to service it shall automatically update and realign itself with the master server. The PIS servers shall synchronise all data continuously to ensure no data loss or corruption of data in case of a server failure.

All interfaces to the PIS shall be fully redundant. There shall be no single point of failure. The failure of any single component (for example, a switch, a NIC, a cable, or a firewall) shall not result in any loss of functionality or availability of the PIS. The PIS network architecture shall be designed such that the redundant PIS data servers can be physically separated and located at any two nodes on the network.

3.2.5 TIME SYNCHRONISATION

The PIS data servers shall be synchronized with the GPS system supplied as part of the Works.

3.2.6 SECURITY

- A user shall be requested to enter a username and password, before being able to access the configuration and diagnostic software of any PIS component.

3.2.7 PIS DATABASE STRUCTURE

- The databases on the PIS data servers shall hold all plant data and shall be open to the queries from the control and instrumentation system data servers and the PIS client. The database structure shall be modifiable to fit the needs of Medupi Power Station.

- Any changes made to the database shall be made in real-time and on-line, and all changes shall be effective without restarting any part of the system.

- The PIS shall make real-time and historical plant information available to third party applications through OPC-UA communication. All the PIS databases shall be accessible by third party software applications on the PIS clients by means of SQL queries. These third-party software applications shall be able to read data from all the PIS databases.

  o **ODBC Interfacing**

    All PIS Databases on all servers shall be supplied with a suitable ODBC driver. This driver shall allow any application that is able to connect to a PIS Database using ODBC to access data on any server. A database shall successfully process any standard ANSI 92 SQL and transact SQL compatible query sent by a remote application through the ODBC driver.

- o **Database Manager**

  All third-party programs shall be able to access all databases through a database manager. The third-party applications shall only be able to read data from the databases. The primary relational database management system (RDBMS) shall use an industry standard interface and query tools. The chosen database management system shall be compatible with the ANSI 92 SQL and transact SQL. All databases residing on all the data server(s) shall be connected to the RDBM. An indexed database server shall exist on the data server(s). It shall hold an index of all data on all databases on the PIS. If a user requires specific data, it shall not be necessary to know on which server the data resides. The user shall only have to connect to a single indexed database server, which shall send the requested queries to the appropriate server or database that holds the data that is required.

- o **Data Integrity**

  The PIS shall clearly indicate and store abnormal data in a clearly identified way. Calculations and programs utilizing abnormal data (e.g., incorrect, disturbed, out of range etc.) shall appropriately and intelligently distinguish the state of the data and shall act to eliminate any incorrect or misleading effect in all related calculations.

3.2.8 REPORTS

As a minimum the following reports shall be created and generated by the Plant Information system on a regular basis:

- • Alarm log
- • Hourly log
- • Daily log
- • Shift log
- • Operating log
- • Incident review logs
- • Running time and status change log
- • Calculated points
- • Summary logs
- • C&I Fault log
- • Statistical evaluation reports
- • Special Dust and Pollutant Emission reports
- • Water Mass Balance Report
- • CPP, Regeneration and Demineralisation Reports
- • Metering reports as specified in the technical guideline, 241-202275 in Appendix C – Project Standards.

All reports generated by the Plant Information System shall be viewable on all PIS Clients. The final list of reports generated by the PIS shall be clarified during the system engineering phase.

The PIS shall automatically create and transmit the generator energy data report over FTP to the Employer's Phoenix Server as defined in the technical guideline, 241-202275 in Appendix C – Project Standards.

3.2.9 Local Area Network (LAN)

The PIS LAN shall be an Ethernet network that conforms to IEEE 802.2 and IEEE 802.3. The PIS LAN shall use the TCP/IP protocol and shall be able to operate at a speed of up to 1000 Mbps at any point on the LAN. The PIS LAN shall be compatible with slower equipment that may be connected to it. Fibre optic cables shall be used throughout to prevent interference as well as performance degradation of the PIS LAN. The PIS and the PIS LAN shall consist of Gigabit Ethernet switches and routing switches. The switches on the PIS LAN shall have remote management capability, as well as a spanning tree algorithm compatible with IEEE 802.1W to protect against unwanted network loops.

3.2.10 Fault Tolerance

No single point of failure shall exist on the PIS LAN that could be the cause of failure of any part of the PIS. A failure in any fibre link, switch, process server, or Client shall not cause the failure of any other process server, data server or any other Client. There shall be no loss of data due to any single fault. Store and forward concepts should be provided to automatically recover from short term system faults.

3.2.11 Historical Data

Upon project completion or refurbishments, the new PIS shall be able to import the historical data from the existing PIS. This shall include data from existing process computers, standalone Historians, paperless recorders etc. The historical data imported into the new PIS shall, as far as practical, be able to be used seamlessly with the new data received from the plant. If seamless integration is not possible, the existing historical data shall, as a minimum, be available for export to other applications such as Microsoft Excel® for manipulation. This historical data shall also be stored for the life of the plant.

3.2.12 Hardware

All computers used in the PIS shall use microprocessors with the x86 architecture. In addition to this, the computers shall not be blade servers. Devices that form part of the PIS shall be consistent with the latest Eskom approved technology. Servers shall comply with the relevant Eskom's Information Security Policy, and other related standards with regards to aspects such as Security, Firewalls, External and Remote Access etc. Client machines shall be compatible with Eskom's latest Group Policy Image.

3.2.13 Old Data Files Removal

The PIS shall include features to automatically remove old data files (files more than 5 years old in the system) to a different hard drive to ensure that the storage on the main hard drive does not get full.

3.3 GENERAL SCOPE OF WORK

- The project includes the replacement of the current GE and Siemens PIS with the new alternative solution available on the market. This replacement is applicable for unit 1 – 6, BOP and SER at Medupi power station.

- The Contractor shall provide, as part of the Works, a Plant Information System (PIS) that is a central database repository for the long-term storage of all plant information produced at Medupi Power Station. This shall include plant information generated by the Contractor's control and instrumentation systems, Others Project Contractor's (such as the Turbine Control & Protection system, Generator Condition Monitor, Boiler Plant Health and Condition Monitoring calculator, H2 plant, N2 plant and Laboratory etc.), as well as other sources identified by the Engineer. The final list of systems that will be incorporated in the PIS shall be clarified and finalised during the system engineering phase. The PIS shall include all modules for the analysis of all the plant information including alarm data, SOE and all control and instrumentation system calculated variables.

- The Contractor shall engineer and configure on the PIS clients as part of the works all process graphics and trends available on the Operator Workstations.

- The system shall be used for the remote access and retrieval of near real-time and historical plant information by the PIS Clients. The station PIS shall provide easily accessible information for power plant technical services such as operating, maintenance, and engineering.

- The contractor is required to include cybersecurity protection services according to the relevant cybersecurity standards. Contractor is also responsible for the DMZ highway.

- The scope of this project includes all activities related to the supply, delivery, offloading, storage, and installation of all the necessary resources to complete the works in all respects.

- The Completion of the works is only accepted by the Employer's representative upon the successful commissioning and handover by the *Contractor* of a fully installed PIS at Medupi power station upon verification of all statutory and operational requirements, whether stated or not stated in this document.

- Unless stated otherwise the *Contractor* supplies all labour as well as plant and materials, equipment, installation, and supervision required for the manufacturing, packaging, delivery to site, offloading, storage, assembly, and installation of all the equipment.

- It is the responsibility of the *Contractor* to verify all the information including dimensions, distances given by the Employer in order to ensure the supplied solution complies with all the standards and specifications.

3.3.1 Additional Requirements Related to the Works

In addition to the above requirements, the following requirements are applicable to the works under this scope of works:

- Procurement, supply, delivery, offloading, storage, installation, commissioning and handover of the complete solution.

- The *Contractor* decommissions and removes the current PIS servers and hand them to the *Employer*'s representative (Eskom).

- The *Contractor* supplies, installs, and commission the new PIS once approved by the *Employer*'s representative.

- The *Contractor* ensures that the approved design for the new PIS is commissioned and the testing on the system for correct functionality, according to statutory and operational requirements as well as industry best practice.

- All equipment supplied and installed shall be accompanied by factory acceptance tests, site acceptance tests, equipment specifications, equipment compliance certificate and installation certificate of compliance for the whole system.

- The *Contractor* is Responsible to ensure that every effort is made to keep to the agreed program and plan.

- The *Contractor* shall ensure timeously inform the Employer of any delays or when outstanding or additional information from the Employer is required.

- Provision to be made for delays that may be caused owing to items being sourced from outside The Republic of South Africa

- The *Contractor* is responsible to ensure that a quality product is delivered.

- The *Contractor* shall provide all required technical datasheets and/or product technical information.

3.4 DESIGN STANDARDS, GUIDELINES AND CODES

- The *Contractor* shall obtain his own copies of International and National standards.

- The *Contractor* shall report any conflict within this specification, with any referenced standards, specifications, or technical guideline.

- This specification shall take precedence over differences existing between this specification and any document except for statutory requirements.

- Substitutions of any standard shall be approved by the Employer. Additional standards proposed by the Contractor shall be submitted to the Employer for approval.

- Only the most recent versions of the relevant standards, guidelines, or codes shall be used with this Works.

3.5 BASIC ENGINEERING

3.5.1 General Requirements

- Basic engineering is defined as being all activities necessary to clearly identify the Contractor's scope and design for the Plant Information System solution.

- The basic engineering activity shall include the Contractor's interfacing and participation with the Engineer, Employer personnel and Other Project Contractors through clarification meetings in order to reach the basic design freeze (DF) completion.

- As a minimum, basic engineering shall consist of the following activities: Concept designs – during which the rules, philosophies and concepts followed in the various engineering and design activities, are clearly defined, clarified and approved.
  - o Investigation work – during which the Contractor conducts his investigation work.
  - o Scope definition – during which detailed scope definition and clarifications are performed.

- During the Contractor's investigation work, the Contractor shall take responsibility for collecting all information from the Employer to enable the Contractor's design to be completed.

- The Contractor shall identify any discrepancies that would lead to shortcomings and/or deviations in the Works and shall make the Employer aware of such discrepancies and provides recommendations, where applicable. The Contractor takes action on such discrepancies.

- Any discrepancies identified are redlined by the Contractor and submitted to the Employer for approval.

- Technical clarification is where the Contractor shall clarify with the Employer and Other Project Contractors all the technical issues to permit the Contractor to start detailed engineering.

- All equipment having long delivery times shall be planned and technically clarified early in the technical clarification stage to allow early Detailed Engineering to commence in parallel.

- The Contractor shall be responsible for maintaining the minutes of the meetings, a deviation schedule and list of open points (LOP) for all engineering activities and shall record all changes to scope during the basic engineering phase.

- Where the Contractor's system interfaces to 3rd party systems (including electrical and civil interfaces provided by others), the Contractor shall coordinate, through the Employer, with Other Project Contractors and design the interface to ensure the overall design is complete and well-engineered.

3.6 DETAILED DESIGN

3.6.1 General Requirements

- Detailed engineering is defined as being all activities required to translate the Contractor's scope and design into a fully functional Plant Information System.

- As a minimum, detailed engineering shall consist of the development, technical clarification and acceptance of the documents defined in as being required for the Detailed Engineering design.

- An independent plant system (independent from the operator information system) shall be provided for the recording and archiving of plant data over the lifetime of the plant. The data shall be stored such that historical information can be retrieved from the database using multiple search criteria, including plant area, time & date, variable limits.

- The system shall have links to external plant-wide information system, with appropriate security against data corruption, unauthorized access, and spread of computer viruses. It furthermore provides storage of the data for online access for a minimum of six months.

- Front-end application software and local area network software for all clients on the Station LAN requiring access to historical data shall be provided. This software runs under standard Windows XP or higher on office computers and communicates with the plant 110 information system via the Station LAN. All data is available using a web server software and a standard Internet browser.

3.6.2 Data Export, Interface and reporting requirements

- Search and export data per Start-, End date, Unit, KKS, KKS description to External source like Microsoft Excel.

- Ability to query data directly from Microsoft Excel by means of an Excel add-in or alternatively directly by using Microsoft Excel Power Query Functionality.

- Ability to interface with Modern Microsoft packages like Power Bi (Read data only).

- Ability to create and save custom reports, calculations based on data retrieved per period, Unit, parameters should be possible in the creation of the reports.

- Ability to Generate the reports based on fixed intervals, example, daily, monthly, weekly, yearly or when specific event occurs like a Unit trip.

- Ability to e-mail generated reports to an e-mail list on specific intervals, daily, weekly, monthly, yearly or specific defined events.

- The end-User should have the ability to create and save custom plant overview screens and save them for plant monitoring purposes.

- Ability to extract data of different variables at synchronized time intervals into a continuous table format.

- Ability to extract data from different sources in the same report, e.g., MW Generated on all units.

3.6.3 Data Trending Requirements

- Ability to trend minimum 8 trend parameters per trend graph.

- Trend per start-, end date, Unit, KKS, KKS description.

- Ability to save trend groups, example Unit 1 Mill 10 trend consisting of a group of parameters related to Unit 1 mill 10.

- Configuration of trend colors and markers should be possible.

- Ability to Export selected portion of trend to external source like Microsoft Excel.

- Ability to configure trend parameter either as line or Bar chart / trend.

- Statistical information per selected period should be made available, mean, standard deviation, sum, range.

- Ability to create x-y / scatter plots.

- Ability to trend data from different sources on the same trend, e.g MW Generated on all units.

3.7 ENGINEERING AND CONTRACTOR'S DESIGN

3.7.1 General Requirements

- The scope of this project includes all activities related to the supply, delivery, offloading, storage, and installation of all the necessary resources to complete the works in all respects.

- The Completion of the works is only accepted by the Employer's representative upon the successful commissioning and handover by the Contractor of a fully installed PIS at Medupi power station upon verification of all statutory and operational requirements,

whether stated or not stated in this document, for the function of overpressure protection.

- Unless stated otherwise the Contractor supplies all labour as well as plant and materials, equipment, installation, and supervision required for the manufacturing, packaging, delivery to site, offloading, storage, assembly, and installation of all the equipment.

- It is the responsibility of the Contractor to verify all the information including dimensions, distances given by the Employer in order to ensure the supplied solution complies with all the standards and specifications.

- The Contractor provides all equipment and services and executes all works to fulfill all requirements specified in this works information.

- The detailed scope of supply for the works is defined by a combination of performance, functional and equipment specifications such that a complete functioning system is provided.

- All documents shall be supplied by Contractor as specified in VDSS, Appendix C of this Specification.

- The Contractor is to obtain his own copies of National and International standards.

3.8 DETAILED REQUIREMENTS

3.8.1.1 Functional Interfaces

- No major change is foreseen with the implementation of this Engineering Change.

- The system interfaces with the existing interfaces but not limited to:
  - DCS (ALSPA DCS Series 6 & SPPA-T3000)
  - BPS
  - TGC
  - FACOS
  - BCM
  - Station Office LAN
  - Third party applications through OPCUA communication

3.8.1.2 Life Expectancy Life (Design Life)

The system shall conform to the design life of Medupi Power Station.

3.8.1.3 Security Requirements

- The installed equipment shall be appropriate protection mechanisms (e.g., password protected) to avoid unauthorised personnel tampering with the settings.

- Caution should be taken by the Contractor to ensure that the PIS system complies to the cybersecurity standards and is well protected from malicious attacks.

- Each client user is requested to enter a username and a password, before being able to access the configuration and diagnostic software associated with a switch or a firewall.

3.8.1.4 Life Cycle Cost Management

As part of replacement, a life cycle management functional specification or Report shall describe and define the following points as a minimum:

- Life cycle costing considerations and total cost of ownership calculations.

- System and component replacement strategy.

- System and component maintenance strategy.

- Spares management strategy.

3.8.1.5 Requirements Related to Equipment Availability and Reliability

- Plant availability and reliability throughout project life must be maintained.

- The system shall be designed for an annual average availability of > 99.98% during the course of the life of the plant.

- The availability excludes hardware upgrades.

- The proposed equipment should have a failure rate of 1% or less over the duration of a calendar year.

- The plant shall be designed such that known failure mechanisms will not prevent the system from achieving its design life or meeting the availability.

- The system design shall incorporate design features to support high reliability of safety significant equipment and high system availability.

3.8.1.6 Standardization and interoperability

- The standardization and interoperability of the system shall be maintained to ensure simpler analysis of the plant, as well as reduce lifecycle management costs.

3.8.1.7 Expandability Assessment

Not Applicable

3.9 PROCUREMENT, INSTALLATION & QUALITY

3.9.1 Quality

- This stage shall consist of the procurement, installation, on-site inspection and testing of all equipment forming part of the Works as well as other items that the *Employer* has specified such as free issued items.

- Eskom's requirements for quality assurance for the successful contractor is defined in the IS09001 standard. Therefore, the successful *Contractor* shall comply fully with the Eskom quality assurance requirements and any amendments which Eskom considers necessary or expedient during the life of the project.

- During the execution of the project the quality of workmanship and selection of materials shall be in accordance with the standards and codes of practice applicable to the project and with the Eskom requirements for quality assurance

- A detailed Quality Control Plan shall be provided by the successful supplier with clearly defined holding and witnessed points. These documents must be developed and accepted prior to installation.

- Quality inspections and tests shall be carried out by the *Contractor* after erection to prove the compliance of the installation with the Specification and the detailed engineering design freeze documentation.

- Erection and installation shall only be considered complete once the quality inspections and tests for the installation concerned have been approved by the *Employer*.

- The *Employer* reserves the right to appoint representatives, on behalf of the Employer, to inspect all parts during erection and to be present at any of the quality inspections and tests.

- The *Employer* is free to specify hold and witness points during the installation and testing stages of the project.

- The *Contractor* shall give twenty-one (21) days advance notice to the Employer of holds and witness points.

- The *Contractor* shall confirm hold and witness points at least nine (9) days prior to the test activity.

- The *Contractor* shall provide all test equipment for any inspections and tests.

- Damaged or defective structural steelwork and materials shall be set aside for the *Employer* to inspect and to decide whether such items may be rectified, repaired, or rejected.

- The *Employer* to have the right to order the removal from the Works of any defective or damaged material which have not been replaced or certified to his satisfaction, even if the material have been built into the Works.

- The *Contractor* to repair and replace all defective materials and rectify all defective workmanship at his own cost.

- All work done shall be approved and accepted by the *Employer.*

3.10 COMPLETION, TESTING, COMMISSIONING AND CORRECTION OF DEFECTS

3.10.1 Work to be done by the Completion Date

- On or before the Completion Date the *Contractor* shall have done everything required to Provide the Works except for the work listed below which may be done after the Completion Date but in any case before the dates stated.

- The Project Manager cannot certify Completion until all the work except that listed below has been done and is also free of Defects which would have, in his opinion, prevented the Employer from using the works and others from doing their work.

3.10.2 Use of the works before Completion has been certified

The Employer has the right to make use of the works before completion, should a need arise.

3.10.3 Materials facilities and samples for tests and inspections

The Contractor provides all necessary testing facilities and samples.

3.10.4 FAT Requirements

- The Contractor shall prepare a detailed test procedure in preparation for FAT and submit same to the Engineer for approval.

- The Engineer determines if any further testing is required in addition to that specified, such as that of any new technologies being used.

- A Final FAT Report shall be prepared by the Contractor that includes the following as a minimum:

    o Test procedures used during FAT.

    o Detailed Test results.

    o Discrepancies identified during the tests.

    o Resolution of the discrepancies.

    o Retests conducted and results thereof.

    o FAT certificate.

- These tests shall be conducted and/or witnessed by Employer representative from C&I Engineering, C&I Maintenance, TUV and Ops Support (Commissioning).

3.10.5 SIT Requirements

- Site Integration Testing (SIT) shall take place at the Medupi site after the equipment is delivered to site and has been installed, powered up and interfaced to the existing plant.

- The SIT shall be carried out before system commissioning commences to ensure:

    o Correct performance of the system.

    o Safety of plant and personnel.

    o Compliance with the Specification and the detailed engineering design freeze documentation.

- As a minimum, the SIT testing and inspection activities provided by the Contractor shall consist of site integration and site acceptance activities defined in IEC 62381.

- The Contractor shall prepare a detailed test procedure in preparation for SIT and submit same to the Employer for approval at least 28 days prior to the scheduled test date.

- As a minimum, the proposed SIT procedure shall identify the following:

    o Major test activities.

    o Comprehensive list and description of the individual tests to be performed.

    o How the tests are to be prepared and conducted.

    o Test dates and durations.

    o Checklists – how the test results will be documented.

    o Acceptance Criteria.

    o How the identified discrepancies will be processed.

- A Final SIT Report shall be prepared by the *Contractor* that includes the following as a minimum:

- o Test procedures used during SIT.

- o Detailed Test results.

- o Discrepancies identified during the tests.

- o Resolution of the discrepancies.

- o Retests conducted and results thereof.

- o SIT certificate.

- The Contractor shall submit the Final SIT Report to the Employer for approval.

- When all tests are successful and the Final SIT Report is approved by the Employer, the system is classified as 'ready for use'. The system is then deemed ready for cold commissioning.

3.10.6 Cold Commissioning

- Commissioning is defined as bringing into service all items of the Works and meeting the functional requirements and performance criteria of the Specification. This includes all necessary testing and verification of the stated performance criteria.

- This stage consists of all field equipment checks, loop checks, drive interface checks, and testing system functionality.

- The *Contractor* shall commission all interfaces to control equipment provided by the Engineer. The *Contractor* shall co-operate fully with the Engineer and the Other Project Contractors in the commissioning of the plant for which the Employer will supply the portion of equipment.

- Before the equipment is placed in service, the *Contractor* shall ensure that it is in a suitable and safe condition for use. This shall include all tests required to ensure safe and accurate measurements such as blow through of measurement lines, pressure testing of measurement lines, filling of reference pots, leak testing where applicable.

- Commissioning of the works is required before Completion of the works is certified by the project manager.

- The *Contractor* shall submit a commissioning procedure to the Employer one month before the planned date of commissioning. This procedure shall detail all of the steps and procedures to be taken in order to demonstrate the functionality of the system as well as checks which prove that the *Contractor* has done everything required of him to provide the Works and fulfil the Purpose of the Works.

- Commissioning shall include all testing and verification of the stated performance criteria.

- The *Contractor* shall adhere to the requirements in 200-16714: Medupi Commissioning Procedure.

3.10.6.1.1 Instruments Test

- Calibrations of all instrumentation forms part of the Works and calibration data sheets shall be provided and signed by both parties and included as part of the documentation package for the Works.

- The *Contractor* shall submit the Cold Commissioning test results to the Engineer at the conclusion of cold commissioning and request the commencement of hot commissioning.

3.10.6.1.2 Function Checks

- The functional tests form part of the cold commissioning and include the checking of all measurement loops, interlocks, sequence controls, analogue controls and interfaces to systems provided by Other Project Contractors.

- The execution and documentation of loop checks shall be used upon standard IEC 62382

3.10.6.2 Hot Commissioning

- Hot commissioning is where the plant processes are placed into operation in conjunction with the control and instrumentation system and Other Project Contractors.

- The Contractor shall be responsible for the hot commissioning of all the equipment forming part of the Works and the interfaces to systems provided by Other Project Contractors to satisfy the requirements of the Specification.

- In cases where various components are connected to form an integrated system, the Contractor, at the time of commissioning, shall carry the responsibility for the correct functioning of the whole of the system.

- If a defect is identified in the equipment interfacing or external to the Contractor's scope the Contractor shall request the Engineer to rectify the defects.

3.10.7 Training and Technology Transfer

3.10.7.1 Training Requirements

- The *Contractor* shall provide training on all equipment included as part of the Works to the various categories of the Employer's technical staff for the duration of the Works.

- The objective of the training is to provide the Medupi Power Station staff with the necessary skills and knowledge to achieve all the plant performance targets with respect to safety, maintainability, availability, reliability and economic plant operation.

- The Contractor shall provide all formal training courses for the maintenance staff at Medupi Power Station.

- Facilities for training will be provided by the Employer at Medupi Power Station and will be a suitably sized air-conditioned room, to accommodate the trainees / trainer as well as trainee and trainer desks, a projector and flipchart or white board.

- Practical hands-on training for each individual trainee shall form the training.

3.10.8 Operational Maintenance after Completion

Maintenance of this system will be performed by C & I maintenance department.

3.11 HEALTH AND SAFETY RISK MANAGEMENT

- It is essential that Eskom as well as the *Contractors* involved adhere to the General Safety regulations of the OHS Act 85 of 1993. This will ensure that all work is performed safely, and all personnel are equipped with appropriate safety equipment and clothing that will mitigate unsafe activities. No person will commence work during the project unless:

- o Activity risk assessment is conducted and reviewed as and when the risk changes.

- o The correct Personal Protective Equipment is provided in line with the activity risk assessment for the works.

- o Work area shall be barricaded accordingly.

- o The person using the relevant equipment has been fully trained in the safe operation and use of such equipment.

- The *Contractor* shall comply with the latest revision of Eskom Medupi Power Station's Health, Safety and Environmental Specifications.

- The *Contractor* shall comply with any other SHE requirements by the *Employer*.

3.11.1 General Requirements

- The *Contractor* complies with the Occupational Health and Safety Act no 85 of 1993 and its regulations, Eskom SHE Policy, Standards, Procedures, Guidelines, Specifications and Regulations.

- The *Contractor* always ensures safety awareness through continuous training.

- The *Contractor* is at all times responsible for the supervision of his employees, agents and Sub-Contractors and takes full responsibility and accountability for ensuring that they are competent, compliant and aware of the legal requirements and other requirements and execute the works accordingly.

- The *Contractor* ensures that all statutory appointments and appointments required by any Eskom Regulations are made in writing and that all appointees fully understand their responsibilities and are trained and competent to execute their duties.

- The *Employer*, or any person appointed by the Employer, may, at any stage during the term of the contract:

  - o 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*.

  - o Refuse any employee, *Sub-Contractor* or agent of the *Contractor* access to the premises if such a person has been found to commit an unsafe act or any unsafe working practice or is found not to be competent or authorized.

  - o Issue the *Contractor* with a stop order, should the *Employer* become aware of any unsafe working procedure or condition or any non-compliance.

- The *Contractor* immediately reports any incidents, disabling injury, near miss, first aid incident as well as any threat to health and safety of which it becomes aware at the works or on the Site to the 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-Contractors*, to the extent permitted by the Occupational Health and Safety Act no 85 of 1993.

- The *Contractor* ensures that all his personnel attend a Health and Safety Induction Course presented by Security Department, Monday to Friday – 09:00 to 11:00, free of charge prior to commencement of any works. This is a two (2) hour course and is valid for the duration of one (1) year at Medupi Power Station.

- The *Contractor* works strictly to regularly updated risk assessment.

- The *Contractor* ensures supervised and authorised entry into the plant.

- The *Contractor* barricades the entire perimeter of the site.

- The *Contractor* ensures at all times compliance with the safety regulations imposed by any act of parliament, or any regulation or by law of any statutory authority.

- The *Contractor* complies with the Occupational Health and Safety Act and Regulations, 1993 and all regulations made there under as well as the Employer's safety and operating procedures.

- The *Contractor* acknowledges that he is fully aware of the requirements of all the above and undertakes to employ people who have received sufficient training that they can comply therewith. The *Contractor* undertakes not to do, or not to allow anything to be done which will contravene any provisions of the act, regulations or operating procedures.

- All employees of the *Contractor* must attend a safety induction course before they are allowed to work on site.

- It is the responsibility of the *Contractor* to ensure that all employees have attended the safety induction.

- The *Contractor* holds a Toolbox Talk and inspects all PPE before any work commences and keep written proof of such actions.

- The *Contractor* complies with all the applicable procedures as required by the *Employer*; Procedures are available from the *Employer's* Documentation Centre on request.

- The *Contractor* familiarizes himself with all permit requirements for work to be done on all plant systems and ensures that permits are applied for accordingly.

- The following risks are identified by the *Employer*, and the *Contractor* includes these in his risk assessment:

  o Injury caused by hand tools.

  o High noise level.

  o Falling when working at heights.

  o Welding which may result in burning.

  o Movement of stairs while walking.

  o Falling objects.

  o Dust

- Any tampering with the *Employer's* fire equipment is strictly forbidden.

- All work done by the *Contractor* shall comply with the latest revision of *Employer's* SHEQ requirement as stated in the Safety, Health and Environmental Specifications and all other *Employer* safety requirements.

- *Employer* compiles a baseline safety risk assessment to identify all the possible risks during the implementation of the project.

- The risk assessment includes all the mitigating strategies to minimize all the possible risks.

- *Employer* provides the *Contractor* with the baseline risk assessment to use it as a minimum requirement to compile a risk assessment identifying all the risks before the implementation commences, the risk assessment compiled by the *Contractor* will clearly show all the mitigating strategies in order to minimize all the possible risks.

- No work shall be carried out without the risk assessment identifying all the risks and the mitigating strategies in place to address the identified risks.

- All necessary subsequent removal of existing installations shall form part of *Contractor* scope.

3.11.2 Safety of workers

- The *Contractor* ensures the safety of all persons working in the Site. Any hot work, including welding, will be applied for in accordance with the permit to work system. No welding will be allowed on site unless permission is granted in writing by the Project Manager.

- All welding, flame cutting and grinding work is properly screened to protect persons from arc flash or eye injuries. Fire blankets are fitted over the scaffolding planks and platforms.

- Precautions are taken to prevent any objects, welding or grinding splatter from falling.

3.11.3 Plant Safety Regulations

- The Employer, on request from the *Contractor*, isolates required plant from all sources of danger as described in the Plant Safety Regulations.

- The Project Manager, on request, makes available a copy of the latest revision of the Plant Safety Regulations to the *Contractor*.

- The *Contractor* complies with all rules and regulations applicable to plant safety and completes the Workman's Register prior to working on the plant.

- The *Contractor* declares any grinding and welding to be carried out on the workers register.

- At every permit change, the *Contractor* withdraws himself/herself/his staff for that period of permit suspension/revocation and thereafter only proceeds with the works after signing onto the new permit.

- The *Contractor* ensures that he/she/all Sub-Contractors/personnel/staff/his visitors are medically, physically and psychologically fit to enter Medupi Power Station and especially any confined space.

- The *Contractor* is prohibited from entering Restricted Areas.

- The responsibility is on the *Contractor* to ensure that the correct confined/hazardous space requirements and tests have been met and done by the Employer prior to entry into any confined space or hazardous plant areas.

- The *Contractor* ensures that all personnel are competent to carry out the works.

- The *Contractor* provides proof of competency for technical and safety aspects and must be available as and when required on site.

3.12 QUALITY MANAGEMENT

- The *Contractor* conforms to the following Quality Management requirements:
  - The quality requirements are as per ISO 9001:2008.
  - Quality Control Plans shall be in the format of Document Identifier 240-1443182036 "Medupi Power Station: Quality Control Plan form".

- Documents submitted for review and acceptance by the Project Manager 30 days after the Contract Date and prior to the commencement of work.

- The *Contractor* submits a full detailed Contract Quality Plan for acceptance within 30 days of the Contract Date.

- No site work and designs are allowed unless the *Employer* accepts the QCP and QIP's.

- The *Contractor* utilises the Employer's quality documentation forms for requesting access, erection checks etc. These request forms must be submitted to the Supervisor at least 72 hours notification for off-site but local (within the country), 15 days if offshore and 24 hours for on-site inspections. This will be coordinated by the quality team and the Supervisors.

- Apart from any statutory data packages required, the *Contractor* also compiles a data package (books) of the relevant drawings, test certificates etc. for each section of work which must be reviewed and signed off by the Supervisor at erection check phase prior to the commencement of the commissioning phase.

- The *Contractor* is responsible for defining the level of QA/QC or inspection to be imposed on his Sub-Contractors and suppliers of material. This level should be based on criticality of equipment and be submitted to the Project Manager for acceptance in the form of a QCP.

- The Contractor submits a schedule of un-priced orders to be placed that is updated monthly.

- The *Contractor* submits a quality report on a monthly basis, including the following:
  - A list of Defects with those older than 30 days being flagged, and an explanation attached.
  - Monthly updated Site and pre-site programme.
  - Foreign inspection dates.
  - Inspections completed/outstanding.
  - Register of accepted Defects.
  - Non-conformance Reports, Corrective Action, Preventative Action and Concessions Reports.
  - Copy of all work instructions and procedures when requested by the Project Manager.
  - The Employer carries out random and scheduled inspections on the plant.

4. ACCEPTANCE

This document has been seen and accepted by:

Name & Surname	Designation
Albert Malapile	C&I Chief Engineer
Neo Nemulalate	C&I Engineer
Matome Rahlana	Senior Technician Engineering
Vusi Mosime	C&I Engineer
Andrew Lekganyane	C&I Engineer
Letago Manyelo	C&I Engineer
Shu Mpangase	C&I Engineer
Joel Manamela	Senior Technologist C&I Engineering
Lucky Mmadihlaba	Senior Advisor C&I Engineering
Pieter Myburgh	Process Engineering Manager
Everard De Kock	Senior Process Engineer
Philip Du Toit	Senior Process Engineer
Angela Mapaya	Process Engineer
Gerto Prinsloo	Process Engineer
Xoliswa Zondi	Process Engineer
Motlatso Monene	Process Engineer

5. REVISIONS

Date	Rev.	Compiler	Remarks
October 2024	1	Moran Khoza	New document

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:
- Moran Khoza
- Albert Malapile

7. ACKNOWLEDGEMENTS

- Neo Nemulalate

- Andrew Lekganyane

- Pieter Myburgh

- Everard De Kock

- Philip Du Toit

- Gerto Prinsloo

APPENDIX A: MATERIAL LIST

Details	Description	Quantity
Hardware basis virtual Server	Virtual Server DL360P Xen [Manual]	10
Terminal Server	Virtual Machine hosted on HP DL360 P	8
PI-System Server 1	Virtual Machine hosted on HP DL360 P	8
Thin Client	HPZ440	10
NIDS	DMZ HP Z420 [Manual]	2
COMOS Server	Virtual Machine hosted on HP DL360 P	8
PIS Data Transfer Server 1 (Quantity 1 - VM) - HP DL360 P	VM - HP DL360 P	8

APPENDIX B: MATERIAL LIST SOFTWARE (TERMINAL SERVERS X8)

Display Name	Publisher
7-Zip 16.04	Igor Pavlov
7-Zip 18.01	Igor Pavlov
Adobe Acrobat Reader DC	Adobe Systems Incorporated
Adobe Flash Player 32 ActiveX	Adobe
Adobe Flash Player 32 NPAPI	Adobe
AMA	Siemens AG
Citrix Tools for Virtual Machines	Citrix Systems, Inc.
Citrix XenCenter	Citrix Systems, Inc.
Configure_Website	SIEMENS AG
HP Array Configuration Utility (64-bit)	Hewlett-Packard Development Company, L.P.
HP Insight Management Agents	Hewlett-Packard Company
HP ProLiant Health Monitor Service (X64)	Hewlett-Packard Company
HP ProLiant iLO 3 WHEA Driver (X64)	Hewlett-Packard Company
HP ProLiant iLO 3/4 Channel Interface Driver	Hewlett-Packard Company
HP ProLiant iLO CHIF Driver (X64)	Hewlett-Packard Company
HP ProLiant iLO Core Driver (X64)	Hewlett-Packard Company
Java 7 Update 76	Oracle
Java 8 Update 20	Oracle Corporation
Java 8 Update 72 (64-bit)	Oracle Corporation
Java Auto Updater	Oracle Corporation

Kiwi Syslog Server 9.4.1 (Service Edition)	http://www.kiwisyslog.com
Matrox Graphics Software (remove only)	
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft Silverlight	Microsoft Corporation
Microsoft SQL Server Compact 4.0 SP1 x64 ENU	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x86)	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x86) English	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable (x64)	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable (x64)	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.17	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.17	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x64) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x86) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Minimum Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Minimum Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x86) - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Minimum Runtime - 12.0.21005	Microsoft Corporation

Microsoft Visual C++ 2017 Redistributable (x64) - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 Redistributable (x86) - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 x64 Additional Runtime - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 x64 Minimum Runtime - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 x86 Additional Runtime - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 x86 Minimum Runtime - 14.11.25325	Microsoft Corporation
Mozilla Firefox 65.0 (x86 en-US)	Mozilla
Mozilla Firefox 68.0.1 (x64 en-US)	Mozilla
Mozilla Maintenance Service	Mozilla
MSXML 4.0 SP2 (KB954430)	Microsoft Corporation
Network Time Protocol	
Notepad++	Notepad++ Team
Notepad++	Notepad++ Team
OPC .NET API 2.00 Redistributables 105.0	OPC Foundation
OPC Core Components Redistributable (x64) 105.0	OPC Foundation
OPC UA Local Discovery Server 1.02	OPC Foundation
OPC UA SDK 1.01 Redistributables 329.1	OPC Foundation
OSIsoft MS Runtime Redistributables	OSIsoft, LLC
PI AF Client 2017 R2	OSIsoft, LLC
PI Buffer Subsystem	OSIsoft, LLC
PI Collective Manager	OSIsoft, LLC
PI Interface Configuration Utility (PI ICU)	OSIsoft, LLC
PI Module Database Builder	OSIsoft, Inc.
PI Network Subsystem	OSIsoft, LLC
PI ProcessBook 2015 R2 SP2	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64 2016	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86 2016	OSIsoft, LLC
PI Spt DLL (PISpt)	OSIsoft, LLC
PI System Management Tools 2017	OSIsoft, LLC
PIGenericNames DLL (GenericNames)	OSIsoft, LLC
PKZIP Server for Windows 12.40.0008	PKWARE, Inc
PuTTY release 0.69	Simon Tatham

RSAKeyExchange	proprietary
Siemens Automation License Manager	Siemens AG
Siemens Automation License Manager V5.3 + SP2 + Upd2	Siemens AG
SIEMENS OPC	Siemens AG
SIMATIC STEP 7	Siemens AG
SIMATIC STEP 7 V5.5 + SP4 + HF5	Siemens AG
SIMATIC CFC	Siemens AG
SIMATIC CFC V8.1 + SP1 + Upd4	Siemens AG
SIMATIC D7-SYS	Siemens AG
SIMATIC D7-SYS V8.0	Siemens AG
SIMATIC Device Drivers	Siemens AG
SIMATIC Device Drivers WoW	Siemens AG
SIMATIC Logon	Siemens AG
SIMATIC Logon V1.5 + SP3	Siemens AG
SIMATIC NCM FWL 64	Siemens AG
SIMATIC NET CORE	Siemens AG
SIMATIC NET PC Software V13.0	Siemens AG
SIMATIC PDM	Siemens AG
SIMATIC PDM Command Service Option	Siemens AG
SIMATIC PDM Command Service Option V8.2 + SP1	Siemens AG
SIMATIC PDM Logon Option	Siemens AG
SIMATIC PDM Logon Option V8.2 + SP1	Siemens AG
SIMATIC PDM Server Option	Siemens AG
SIMATIC PDM Server Option V8.2 + SP1	Siemens AG
SIMATIC PDM V8.2 + SP1	Siemens AG
SIMATIC Runtime Interfaces	Siemens AG
SIMATIC Runtime Manager	Siemens AG
SIMATIC S7 F ConfigurationPack	Siemens AG
SIMATIC S7 F ConfigurationPack V5.5 + SP11	Siemens AG
SIMATIC S7 F Systems	Siemens AG
SIMATIC S7 F Systems Library	Siemens AG
SIMATIC S7 F Systems Library V1.3 + SP1 + Upd1	Siemens AG
SIMATIC S7 F Systems V6.1 + SP2	Siemens AG
SIMATIC SCS	Siemens AG
SIMOTION OPC File Manager	Siemens AG
SL64SUPPORT	Siemens AG
SPPABackup	Siemens AG

SPPA-M3000	Siemens PG IE
SPPA-T3000 Replicated Archive	Siemens AG
Stratus Protected VM 6.2.0.9231 Hotfix 10	Stratus Technologies
Supplier Documentation	proprietary
TreeSize Free V3.3.2	JAM Software
Trend Micro OfficeScan Client	Trend Micro
WinSCP 5.5.6	Martin Prikryl

APPENDIX C: MATERIAL LIST SOFTWARE (PI-SYSTEM SERVER X8)

Display Name	Publisher
Tools for .Net 3.5	Microsoft Corporation
Adobe Flash Player 31 NPAPI	Adobe Systems Incorporated
Adobe Reader XI MUI	Adobe Systems Incorporated
Build Tools - amd64	Microsoft Corporation
Build Tools - x86	Microsoft Corporation
Build Tools Language Resources - amd64	Microsoft Corporation
Build Tools Language Resources - x86	Microsoft Corporation
Citrix Tools for Virtual Machines	Citrix Systems, Inc.
Citrix XenCenter	Citrix Systems, Inc.
Definition Update for Microsoft Office 2013 (KB3115404) 32-Bit Edition	MicrosoftP
Microsoft .NET Framework 4 Multi-Targeting Pack	Microsoft Corporation
Microsoft .NET Framework 4.5 Multi-Targeting Pack	Microsoft Corporation
Microsoft .NET Framework 4.5 SDK	Microsoft Corporation
Microsoft .NET Framework 4.5.1 Multi-Targeting Pack	Microsoft Corporation
Microsoft .NET Framework 4.5.1 Multi-Targeting Pack (ENU)	Microsoft Corporation
Microsoft .NET Framework 4.5.1 SDK	Microsoft Corporation
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft Access MUI (English) 2013	Microsoft Corporation
Microsoft Access Setup Metadata MUI (English) 2013	Microsoft Corporation
Microsoft DCF MUI (English) 2013	Microsoft Corporation
Microsoft Excel MUI (English) 2013	Microsoft Corporation
Microsoft Groove MUI (English) 2013	Microsoft Corporation
Microsoft Help Viewer 2.1	Microsoft Corporation
Microsoft Help Viewer 2.1	Microsoft Corporation

Microsoft InfoPath MUI (English) 2013	Microsoft Corporation
Microsoft Lync MUI (English) 2013	Microsoft Corporation
Microsoft Office 64-bit Components 2013	Microsoft Corporation
Microsoft Office OSM MUI (English) 2013	Microsoft Corporation
Microsoft Office OSM UX MUI (English) 2013	Microsoft Corporation
Microsoft Office Professional Plus 2013	Microsoft Corporation
Microsoft Office Professional Plus 2013	Microsoft Corporation
Microsoft Office Proofing (English) 2013	Microsoft Corporation
Microsoft Office Proofing Tools 2013 - English	Microsoft Corporation
Microsoft Office Proofing Tools 2013 - Espa?ol	Microsoft Corporation
Microsoft Office Shared 64-bit MUI (English) 2013	Microsoft Corporation
Microsoft Office Shared 64-bit Setup Metadata MUI (English) 2013	Microsoft Corporation
Microsoft Office Shared MUI (English) 2013	Microsoft Corporation
Microsoft Office Shared Setup Metadata MUI (English) 2013	Microsoft Corporation
Microsoft OneNote MUI (English) 2013	Microsoft Corporation
Microsoft Outlook MUI (English) 2013	Microsoft Corporation
Microsoft PowerPoint MUI (English) 2013	Microsoft Corporation
Microsoft Publisher MUI (English) 2013	Microsoft Corporation
Microsoft Silverlight	Microsoft Corporation
Microsoft SQL Server 2012 Management Objects	Microsoft Corporation
Microsoft System CLR Types for SQL Server 2012	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x86)	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x86) English	Microsoft Corporation
Microsoft Visual Basic PowerPacks 1.2	Microsoft
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable (x64)	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.4148	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.4148	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x64) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x86) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Minimum Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Minimum Runtime - 11.0.61030	Microsoft Corporation

Microsoft Visual C++ 2013 Redistributable (x64) - 12.0.30501	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x86) - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x64 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x64 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2015 Redistributable (x64) - 14.0.24212	Microsoft Corporation
Microsoft Visual C++ 2015 Redistributable (x86) - 14.0.24212	Microsoft Corporation
Microsoft Visual C++ 2017 Redistributable (x64) - 14.14.26429	Microsoft Corporation
Microsoft Visual C++ 2017 Redistributable (x86) - 14.14.26429	Microsoft Corporation
Microsoft Visual C++ 2017 x64 Additional Runtime - 14.14.26429	Microsoft Corporation
Microsoft Visual C++ 2017 x64 Minimum Runtime - 14.14.26429	Microsoft Corporation
Microsoft Visual C++ 2017 x86 Additional Runtime - 14.14.26429	Microsoft Corporation
Microsoft Visual C++ 2017 x86 Minimum Runtime - 14.14.26429	Microsoft Corporation
Microsoft Visual Studio 2010 Tools for Office Runtime (x64)	Microsoft Corporation
Microsoft Visual Studio 2010 Tools for Office Runtime (x64)	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Isolated)	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Isolated)	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Isolated) Resources	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Minimum)	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Minimum) Interop Assemblies	Microsoft Corporation
Microsoft Visual Studio 2013 Shell (Minimum) Resources	Microsoft Corporation
Microsoft Visual Studio Ultimate 2013 XAML UI Designer Core	Microsoft Corporation
Microsoft Visual Studio Ultimate 2013 XAML UI Designer enu Resources	Microsoft Corporation
Microsoft Word MUI (English) 2013	Microsoft Corporation
Network Time Protocol	
Notepad++	Notepad++ Team
OSIsoft MS Runtime Redistributables	OSIsoft, LLC
OSIsoft MS Runtime Redistributables x64	OSIsoft, Inc.
OSIsoft MS VB Runtime Redistributables	OSIsoft, LLC
PI AF Client 2018 SP1	OSIsoft, LLC
PI Application Programming Interface x64	OSIsoft, LLC
PI Application Programming Interface x64	OSIsoft, LLC
PI Batch Generator Interface	OSIsoft, LLC
PI Buffer Subsystem	OSIsoft, LLC
PI Collective Manager 2018	OSIsoft, LLC
PI Data Archive 2018	OSIsoft, LLC
PI Data Archive 2018	OSIsoft, LLC.

PI DataLink 2017 x64	OSIsoft, LLC
PI DataLink 2017 x86	OSIsoft, LLC
PI Interface Configuration Utility (PI ICU)	OSIsoft, LLC
PI Interface for Performance Monitor (PIPerfMon)	OSIsoft, LLC
PI Interface for Performance Monitor (PIPerfMon) - ICU Control	OSIsoft, LLC
PI Interface for Ping (PIPing)	OSIsoft, LLC
PI Interface for Ping (PIPing) - ICU Control	OSIsoft, LLC
PI Interface for SNMP (PISNMP)	OSIsoft, LLC
PI Interface for SNMP (PISNMP) - ICU Control	OSIsoft, LLC
PI Interface for TCP Response (TCPResponse)	OSIsoft, LLC
PI Interface for TCP Response (TCPResponse) - ICU Control	OSIsoft, LLC
PI Module Database Builder	OSIsoft, Inc.
PI ODBC 2016 R2 (x64)	OSIsoft, LLC.
PI ODBC 2016 R2 (x86)	OSIsoft, LLC.
PI OLEDB 2016	OSIsoft, LLC.
PI OLEDB 2016 (x64)	OSIsoft, LLC.
PI OLEDB Enterprise 2016 R2	OSIsoft, LLC.
PI OLEDB Enterprise 2016 R2 (x64)	OSIsoft, LLC.
PI OPC DA Server 2018 (x64)	OSISoft, LLC
PI OPC DA Server 2018 (x64)	OSIsoft, LLC
PI OPC HDA Server	OSIsoft, LLC
PI OPC HDA Server 2016	OSISoft, LLC
PI OPC Tools (OPCTools) Set	OSIsoft, LLC
PI ProcessBook 2015 R2 SP2	OSIsoft, LLC
PI Ramp Soak Simulator (rmp_sk) Interface X64	OSIsoft, LLC
PI Random Simulator (random) Interface X64	OSIsoft, LLC
PI Server 2018 Installer	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64 2018	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86 2018	OSIsoft, LLC
PI Spt DLL (PISpt)	OSIsoft, LLC
PI SQL Commander Lite 2016 R2 (x64)	OSIsoft, LLC.
PI SQL Commander Lite 2016 R2 (x86)	OSIsoft, LLC.
PI SQL Data Access Server (OLE DB)	OSIsoft, LLC.
PI System Management Tools 2018	OSIsoft, LLC
PI TagConfigurator	OSIsoft, LLC
PIGenericNames DLL (GenericNames)	OSIsoft, LLC

PowerShell Tools for the PI System	OSIsoft, LLC
Security Update for Microsoft Excel 2013 (KB3118284) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Excel 2013 (KB3118284) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Excel 2013 (KB3118284) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Excel 2013 (KB3118284) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Excel 2013 (KB3118284) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3039746) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3039794) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3039798) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3039798) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3054816) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3114340) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3118268) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Office 2013 (KB3118268) 32-Bit Edition	MicrosoftP
Security Update for Microsoft OneNote 2013 (KB3115256) 32-Bit Edition	MicrosoftP
Security Update for Microsoft OneNote 2013 (KB3115256) 32-Bit Edition	MicrosoftP
Security Update for Microsoft OneNote 2013 (KB3115256) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Outlook 2013 (KB3118280) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Outlook 2013 (KB3118280) 32-Bit Edition	MicrosoftP
Security Update for Microsoft PowerPoint 2013 (KB3115487) 32-Bit Edition	MicrosoftP
Security Update for Microsoft PowerPoint 2013 (KB3115487) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Publisher 2013 (KB3085561) 32-Bit Edition	MicrosoftP
Security Update for Microsoft Publisher 2013 (KB3085561) 32-Bit Edition	MicrosoftP
Service Pack 1 for Microsoft Office 2013 (KB2850036) 32-Bit Edition	MicrosoftP
Service Pack 1 for Microsoft Office 2013 (KB2850036) 32-Bit Edition	MicrosoftP
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Service Pack 1 for Microsoft Office 2013 (KB2850036) 32-Bit Edition	MicrosoftP
Service Pack 1 for Microsoft Office 2013 (KB2850036) 32-Bit Edition	MicrosoftP
Snapshot (remove only)	
SPPA-M3000	Siemens PG IE
Stratus Protected VM 6.2.0.9231 Hotfix 10	Stratus Technologies
TreeSize Free V3.3.2	JAM Software
Trend Micro OfficeScan Client	Trend Micro
UaExpert 1.4.4	UnifiedAutomation
UaGateway 1.5.3	UnifiedAutomation
UaGateway_COM_ProxyStub_3.00.101.2	Unified Automation GmbH
Update for (KB2504637)	Microsoft Corporation
Update for Microsoft Access 2013 (KB3114948) 32-Bit Edition	MicrosoftP
Update for Microsoft Access 2013 (KB3114948) 32-Bit Edition	MicrosoftP
Update for Microsoft InfoPath 2013 (KB3114818) 32-Bit Edition	MicrosoftP
Update for Microsoft InfoPath 2013 (KB3114946) 32-Bit Edition	MicrosoftP
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Update for Microsoft InfoPath 2013 (KB3114946) 32-Bit Edition	MicrosoftP
Update for Microsoft InfoPath 2013 (KB3114946) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2760344) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2760371) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2883095) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2889863) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2899522) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2975869) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB2975869) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3023049) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3023052) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3023068) 32-Bit Edition	MicrosoftP

Update for Microsoft Office 2013 (KB3023068) 32-Bit Edition	MicrosoftP
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Update for Microsoft Office 2013 (KB3039701) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039720) 32-Bit Edition	MicrosoftP
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Update for Microsoft Office 2013 (KB3039756) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039756) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039766) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039778) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039795) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3039800) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3054783) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3054785) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3054819) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3054856) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3055007) 32-Bit Edition	MicrosoftP

Update for Microsoft Office 2013 (KB3085486) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3085565) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3085570) 32-Bit Edition	MicrosoftP
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Update for Microsoft Office 2013 (KB3085577) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3085577) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3085577) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3085587) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3101487) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3101491) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3101503) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3114488) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3114499) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3114825) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3114835) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3114835) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3115257) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3115257) 32-Bit Edition	MicrosoftP
Update for Microsoft Office 2013 (KB3115485) 32-Bit Edition	MicrosoftP
Update for Microsoft OneDrive for Business (KB3115492) 32-Bit Edition	MicrosoftP
Update for Microsoft OneDrive for Business (KB3115492) 32-Bit Edition	MicrosoftP
Update for Microsoft OneDrive for Business (KB3115492) 32-Bit Edition	MicrosoftP
Update for Microsoft OneDrive for Business (KB3115492) 32-Bit Edition	MicrosoftP
Update for Microsoft Outlook Social Connector 2013 (KB3054854) 32-Bit Edition	MicrosoftP
Update for Microsoft Outlook Social Connector 2013 (KB3054854) 32-Bit Edition	MicrosoftP
Update for Microsoft Project 2013 (KB3115493) 32-Bit Edition	MicrosoftP
Update for Microsoft Visio Viewer 2013 (KB2817301) 32-Bit Edition	MicrosoftP
Update for Microsoft Visio Viewer 2013 (KB2817301) 32-Bit Edition	MicrosoftP
Update for Microsoft Word 2013 (KB2878319) 32-Bit Edition	MicrosoftP
Update for Microsoft Word 2013 (KB3118276) 32-Bit Edition	MicrosoftP
Update for Microsoft Word 2013 (KB3118276) 32-Bit Edition	MicrosoftP
Update for Microsoft Word 2013 (KB3118276) 32-Bit Edition	MicrosoftP
Update for Microsoft Word 2013 (KB3118276) 32-Bit Edition	MicrosoftP
Update for Skype for Business 2015 (KB3039776) 32-Bit Edition	MicrosoftP
Update for Skype for Business 2015 (KB3118281) 32-Bit Edition	MicrosoftP
Update for Skype for Business 2015 (KB3118281) 32-Bit Edition	MicrosoftP

Update for Skype for Business 2015 (KB3118281) 32-Bit Edition	MicrosoftP
Visual Basic for Applications (R) Core	Microsoft Corporation
Visual Basic for Applications (R) Core - English	Microsoft Corporation
Visual Studio 2013 Prerequisites	Microsoft Corporation
Visual Studio 2013 Prerequisites - ENU Language Pack	Microsoft Corporation

APPENDIX D: MATERIAL LIST SOFTWARE (THIN CLIENT X10)

Display Name	Publisher
7-Zip 16.00	Igor Pavlov
Adobe Flash Player 18 ActiveX	Adobe Systems Incorporated
Adobe Reader XI (11.0.17)	Adobe Systems Incorporated
BurnTool	Siemens AG
Citrix XenCenter	Citrix Systems, Inc.
Java 7 Update 55	Oracle
Java 8 Update 65	Oracle Corporation
Microsoft .NET Framework 4.6	Microsoft Corporation
Microsoft .NET Framework 4.6	Microsoft Corporation
Microsoft Office Access MUI (English) 2007	Microsoft Corporation
Microsoft Office Access Setup Metadata MUI (English) 2007	Microsoft Corporation
Microsoft Office Excel MUI (English) 2007	Microsoft Corporation
Microsoft Office InfoPath MUI (English) 2007	Microsoft Corporation
Microsoft Office Office 64-bit Components 2007	Microsoft Corporation
Microsoft Office Outlook MUI (English) 2007	Microsoft Corporation
Microsoft Office PowerPoint MUI (English) 2007	Microsoft Corporation
Microsoft Office Professional Plus 2007	Microsoft Corporation
Microsoft Office Professional Plus 2007	Microsoft Corporation
Microsoft Office Proof (English) 2007	Microsoft Corporation
Microsoft Office Proof (French) 2007	Microsoft Corporation
Microsoft Office Proof (Spanish) 2007	Microsoft Corporation
Microsoft Office Proofing (English) 2007	Microsoft Corporation
Microsoft Office Publisher MUI (English) 2007	Microsoft Corporation
Microsoft Office Shared 64-bit MUI (English) 2007	Microsoft Corporation
Microsoft Office Shared 64-bit Setup Metadata MUI (English) 2007	Microsoft Corporation
Microsoft Office Shared MUI (English) 2007	Microsoft Corporation
Microsoft Office Shared Setup Metadata MUI (English) 2007	Microsoft Corporation
Microsoft Office Word MUI (English) 2007	Microsoft Corporation

Microsoft Visual Basic for Applications 7.1 (x86)	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x86) English	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x64) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x86) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x64 Minimum Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Additional Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 x86 Minimum Runtime - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x64) - 12.0.30501	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x86) - 12.0.30501	Microsoft Corporation
Microsoft Visual C++ 2013 x64 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x64 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2015 Redistributable (x64) - 14.0.23918	Microsoft Corporation
Microsoft Visual C++ 2015 Redistributable (x86) - 14.0.23918	Microsoft Corporation
Microsoft Visual C++ 2015 x64 Additional Runtime - 14.0.23918	Microsoft Corporation
Microsoft Visual C++ 2015 x64 Minimum Runtime - 14.0.23918	Microsoft Corporation
Microsoft Visual C++ 2015 x86 Additional Runtime - 14.0.23918	Microsoft Corporation
Microsoft Visual C++ 2015 x86 Minimum Runtime - 14.0.23918	Microsoft Corporation
MSXML 4.0 SP2 (KB954430)	Microsoft Corporation
Network Time Protocol	
NVIDIA Control Panel 331.65	NVIDIA Corporation
NVIDIA Graphics Driver 331.65	NVIDIA Corporation
NVIDIA Install Application	NVIDIA Corporation
NVIDIA nView 140.75	NVIDIA Corporation
OSIsoft MS Runtime Redistributables	OSIsoft, LLC
PI AF Client 2017 SP2	OSIsoft, LLC
PI Buffer Subsystem	OSIsoft, LLC
PI ProcessBook 2015 R2 SP2	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64 2016	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86	OSIsoft, LLC

Medupi Power Station PIS Replacement Project Scope of Work

Unique Identifier: **241-2022970**
Revision: **1**
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PI Software Development Kit (PI SDK) x86 2016	OSIsoft, LLC
Puppet (64-bit)	Puppet Labs
PuTTY release 0.67	Simon Tatham
Realtek High Definition Audio Driver	Realtek Semiconductor Corp.
RSAKeyExchange	proprietary
Secure Global Desktop Client	Oracle
Supplier Documentation	proprietary
Trend Micro OfficeScan Client	Trend Micro
TXPplusThinClient	Siemens AG, Power Generation

APPENDIX E: MATERIAL LIST SOFTWARE (COMMOS SERVER X8)

Display Name	Publisher
7-Zip 16.00	Igor Pavlov
Adobe Reader XI (11.0.17)	Adobe Systems Incorporated
Bentley DGN IFilter	Bentley Systems, Incorporated
Bentley Dgn Index Service	Bentley Systems, Incorporated
Bentley DGN Preview Handler	Bentley Systems, Incorporated
Bentley DGN Thumbnail Provider	Bentley Systems, Incorporated
Bentley DgnDb iModel Importer 1.6 x64	Bentley Systems, Incorporated
Bentley DgnDb iModel Importer 2.0 x64	Bentley Systems, Incorporated
COMOS 10.1 Release 5	Siemens AG
Comos License Management 2.0.2	Siemens AG
CONNECT Advisor	Bentley Systems, Incorporated
CONNECT Advisor	Bentley Systems, Incorporated
CONNECTION Client	Bentley Systems, Incorporated
CONNECTION Client	Bentley Systems, Incorporated
GPL Ghostscript	Artifex Software Inc.
Hardlock Device Drivers	
HDR Preview	Bentley Systems, Incorporated
Herramientas de correcci?n de Microsoft Office 2016: espa?ol	Microsoft Corporation
HP Array Configuration Utility (64-bit)	Hewlett-Packard Development Company, L.P.
HP Insight Management Agents	Hewlett-Packard Company
HP ProLiant Health Monitor Service (X64)	Hewlett-Packard Company
HP ProLiant iLO 3 WHEA Driver (X64)	Hewlett-Packard Company
HP ProLiant iLO 3/4 Channel Interface Driver	Hewlett-Packard Company

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HP ProLiant iLO CHIF Driver (X64)	Hewlett-Packard Company
HP ProLiant iLO Core Driver (X64)	Hewlett-Packard Company
Java 7 Update 55	Oracle
Kiwi Syslog Server 9.4.1 (Service Edition)	http://www.kiwisyslog.com
Matrox Graphics Software (remove only)	
MetroStation	Bentley Systems, Incorporated
Microsoft .NET Framework 4 Multi-Targeting Pack	Microsoft Corporation
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft Application Error Reporting	Microsoft Corporation
Microsoft Excel MUI (English) 2016	Microsoft Corporation
Microsoft Groove MUI (English) 2016	Microsoft Corporation
Microsoft Help Viewer 1.1	Microsoft Corporation
Microsoft Help Viewer 1.1	Microsoft Corporation
Microsoft ODBC Driver 11 for SQL Server	Microsoft Corporation
Microsoft Office 32-bit Components 2016	Microsoft Corporation
Microsoft Office Online Server	Microsoft Corporation
Microsoft Office OSM MUI (English) 2016	Microsoft Corporation
Microsoft Office OSM UX MUI (English) 2016	Microsoft Corporation
Microsoft Office Proofing (English) 2016	Microsoft Corporation
Microsoft Office Proofing Tools 2016 - English	Microsoft Corporation
Microsoft Office Shared 32-bit MUI (English) 2016	Microsoft Corporation
Microsoft Office Shared MUI (English) 2016	Microsoft Corporation
Microsoft Office Shared Setup Metadata MUI (English) 2016	Microsoft Corporation
Microsoft Office Standard 2016	Microsoft Corporation
Microsoft Office Standard 2016	Microsoft Corporation
Microsoft Office Web Apps	Microsoft Corporation
Microsoft Office Web Apps English Language Pack	Microsoft Corporation
Microsoft Office Web Apps Global Components	Microsoft Corporation
Microsoft OneNote MUI (English) 2016	Microsoft Corporation
Microsoft Outlook MUI (English) 2016	Microsoft Corporation
Microsoft PowerPoint MUI (English) 2016	Microsoft Corporation
Microsoft Publisher MUI (English) 2016	Microsoft Corporation
Microsoft Report Viewer 2014 Runtime	Microsoft Corporation
Microsoft Server Proof (Arabic) 2016	Microsoft Corporation
Microsoft Server Proof (English) 2016	Microsoft Corporation
Microsoft Server Proof (French) 2016	Microsoft Corporation

Microsoft Server Proof (German) 2016	Microsoft Corporation
Microsoft Server Proof (Russian) 2016	Microsoft Corporation
Microsoft Server Proof (Spanish) 2016	Microsoft Corporation
Microsoft SQL Server 2008 R2 Management Objects	Microsoft Corporation
Microsoft SQL Server 2008 Setup Support Files	Microsoft Corporation
Microsoft SQL Server 2012 Native Client	Microsoft Corporation
Microsoft SQL Server 2014 (64-bit)	
Microsoft SQL Server 2014 (64-bit)	Microsoft Corporation
Microsoft SQL Server 2014 Express LocalDB	Microsoft Corporation
Microsoft SQL Server 2014 Policies	Microsoft Corporation
Microsoft SQL Server 2014 RS Add-in for SharePoint	Microsoft Corporation
Microsoft SQL Server 2014 RsFx Driver	Microsoft Corporation
Microsoft SQL Server 2014 Setup (English)	Microsoft Corporation
Microsoft SQL Server 2014 Transact-SQL Compiler Service	Microsoft Corporation
Microsoft SQL Server 2014 Transact-SQL ScriptDom	Microsoft Corporation
Microsoft SQL Server System CLR Types	Microsoft Corporation
Microsoft System CLR Types for SQL Server 2014	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x64)	Microsoft Corporation
Microsoft Visual Basic for Applications 7.1 (x64) English	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable (x64)	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.17	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.17	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Runtime - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x64) - 12.0.30501	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x86) - 12.0.30501	Microsoft Corporation
Microsoft Visual C++ 2013 x64 Additional Runtime - 12.0.21005	Microsoft Corporation

Microsoft Visual C++ 2013 x64 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Additional Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2013 x86 Minimum Runtime - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2015 Redistributable (x64) - 14.0.23026	Microsoft Corporation
Microsoft Visual C++ 2015 x64 Additional Runtime - 14.0.23026	Microsoft Corporation
Microsoft Visual C++ 2015 x64 Minimum Runtime - 14.0.23026	Microsoft Corporation
Microsoft Visual Studio 2010 Shell (Isolated) - ENU	Microsoft Corporation
Microsoft Visual Studio Tools for Applications x64 Runtime 3.0	Microsoft Corporation
Microsoft Visual Studio Tools for Applications x86 Runtime 3.0	Microsoft Corporation
Microsoft VSS Writer for SQL Server 2014	Microsoft Corporation
Microsoft Word MUI (English) 2016	Microsoft Corporation
MicroStation PowerDraft CONNECT Edition	Bentley Systems, Incorporated
MicroStation PowerDraft CONNECT Edition	Bentley Systems, Incorporated
MSXML 4.0 SP2 (KB954430)	Microsoft Corporation
Network Time Protocol	
Notepad++	Notepad++ Team
OPC UA SDK 1.00 Redistributables 250.8	OPC Foundation
Outils de v?rification linguistique 2016 de Microsoft Office?-Fran?ais	Microsoft Corporation
PDF-XChange 4 Pro	Tracker Software Products Ltd
PDF-XChange Editor	Tracker Software Products (Canada) Ltd.
PDF-XChange Editor	Tracker Software Products (Canada) Ltd.
PKZIP Server for Windows 12.40.0008	PKWARE, Inc
Pointools32Ext	Bentley Systems, Incorporated
PuTTY release 0.67	Simon Tatham
RSAKeyExchange	proprietary
Siemens Automation License Manager	Siemens AG
Siemens Automation License Manager V5.3 + Upd1	Siemens AG
Siemens ComosExtensions	Siemens
SPPABackup	Siemens AG
SPPA-T3000 Comos Integration	Siemens

SQL Server 2014 Analysis Services	Microsoft Corporation
SQL Server 2014 Analysis Services	Microsoft Corporation
SQL Server 2014 Client Tools	Microsoft Corporation
SQL Server 2014 Client Tools	Microsoft Corporation
SQL Server 2014 Common Files	Microsoft Corporation
SQL Server 2014 Common Files	Microsoft Corporation
SQL Server 2014 Data quality client	Microsoft Corporation
SQL Server 2014 Data quality client	Microsoft Corporation
SQL Server 2014 Data quality service	Microsoft Corporation
SQL Server 2014 Data quality service	Microsoft Corporation
SQL Server 2014 Database Engine Services	Microsoft Corporation
SQL Server 2014 Database Engine Services	Microsoft Corporation
SQL Server 2014 Database Engine Services	Microsoft Corporation
SQL Server 2014 Database Engine Services	Microsoft Corporation
SQL Server 2014 Database Engine Shared	Microsoft Corporation
SQL Server 2014 Database Engine Shared	Microsoft Corporation
SQL Server 2014 Distributed Replay	Microsoft Corporation
SQL Server 2014 Distributed Replay	Microsoft Corporation
SQL Server 2014 Distributed Replay	Microsoft Corporation
SQL Server 2014 Distributed Replay	Microsoft Corporation
SQL Server 2014 Documentation Components	Microsoft Corporation
SQL Server 2014 Documentation Components	Microsoft Corporation
SQL Server 2014 Documentation Components	Microsoft Corporation
SQL Server 2014 Full text search	Microsoft Corporation
SQL Server 2014 Integration Services	Microsoft Corporation
SQL Server 2014 Integration Services	Microsoft Corporation
SQL Server 2014 Management Studio	Microsoft Corporation
SQL Server 2014 Management Studio	Microsoft Corporation
SQL Server 2014 Reporting Services	Microsoft Corporation
SQL Server 2014 Reporting Services	Microsoft Corporation
SQL Server 2014 RS_SharePoint_SharedService	Microsoft Corporation
SQL Server 2014 SQL Data Quality Common	Microsoft Corporation
SQL Server Browser for SQL Server 2014	Microsoft Corporation
Sql Server Customer Experience Improvement Program	Microsoft Corporation
Supplier Documentation	proprietary
Trend Micro OfficeScan Client	Trend Micro
Visual Studio 2010 Prerequisites - English	Microsoft Corporation
WinSCP 5.5.6	Martin Prikryl

APPENDIX F: MATERIAL LIST SOFTWARE (PIS DATA TRANSFER SERVER X8)

Display Name	Publisher
Adobe Flash Player 10 Plugin	Adobe Systems Incorporated
Adobe Flash Player 32 ActiveX	Adobe
Adobe Reader XI MUI	Adobe Systems Incorporated
Citrix Tools for Virtual Machines	Citrix Systems, Inc.
Google Chrome	Google LLC
Java 8 Update 111 (64-bit)	Oracle Corporation
Java 8 Update 72 (64-bit)	Oracle Corporation
MatrikonOPC Analyzer	MatrikonOPC
MatrikonOPC Explorer	MatrikonOPC
MatrikonOPC HDA Explorer	MatrikonOPC
Microsoft .NET Framework 1.1	Microsoft
Microsoft .NET Framework 4.6.2	Microsoft Corporation
Microsoft Silverlight	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable	Microsoft Corporation
Microsoft Visual C++ 2005 Redistributable (x64)	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.6161	Microsoft Corporation
Microsoft Visual C++ 2010 x64 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x64) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2012 Redistributable (x86) - 11.0.61030	Microsoft Corporation
Microsoft Visual C++ 2013 Redistributable (x86) - 12.0.21005	Microsoft Corporation
Microsoft Visual C++ 2017 Redistributable (x64) - 14.11.25325	Microsoft Corporation
Microsoft Visual C++ 2017 Redistributable (x86) - 14.11.25325	Microsoft Corporation
Microsoft Visual Studio 2010 Tools for Office Runtime (x64)	Microsoft Corporation
Microsoft Visual Studio 2010 Tools for Office Runtime (x64)	Microsoft Corporation
Mozilla Firefox 78.0.2 (x64 en-US)	Mozilla
Mozilla Maintenance Service	Mozilla
Network Time Protocol	
Notepad++ (64-bit x64)	Notepad++ Team
OPC .NET API 2.00 Redistributables 105.0	OPC Foundation
OPC Core Components Redistributable (x64) 105.0	OPC Foundation

OPC UA SDK 1.01 Redistributables 329.1	OPC Foundation
OSIsoft MS Runtime Redistributables	OSIsoft, LLC
OSIsoft MS VB Runtime Redistributables	OSIsoft, LLC
PI AF Client 2018	OSIsoft, LLC
PI Buffer Subsystem	OSIsoft, LLC
PI DataLink 2017 SP2 x64	OSIsoft, LLC
PI DataLink 2017 SP2 x86	OSIsoft, LLC
PI Language Settings Tool 2012	OSIsoft, LLC
PI Network Subsystem	OSIsoft, LLC
PI ProcessBook 2015 R2 SP2	OSIsoft, LLC
PI Software Development Kit (PI SDK) x64 2018	OSIsoft, LLC
PI Software Development Kit (PI SDK) x86 2018	OSIsoft, LLC
PuTTY release 0.74 (64-bit)	Simon Tatham
SPPA-M3000	Siemens PD PA DE-L
Stratus Protected VM 6.2.0.9164 Hotfix 6	Stratus Technologies
Trend Micro OfficeScan Client	Trend Micro

APPENDIX G: DESIGN STANDARDS, GUIDELINES AND CODES

Type	Number	Name
Eskom	240-55410927	Cyber Security Standard for Operational Technology
SANS	SANS 10400, 1990	The application of the national building regulations
ISO	ISO 9001	Quality Management Systems
Eskom	240-56227443	Requirements for Control and Power Cables for Power Station Standard
SANA	SANS 10142-1	The Wiring of Premises, Part 1 – Low-Voltage Installations
Eskom	240-56355466	Alarm Management System Standard
Eskom	240-52844017	System Reliability, Availability and Maintainability Analysis Guideline
Eskom	240-56355815	Junction Boxes and Cable Termination Standard
Eskom	240-49230111	HAZOP Analysis Guideline
Eskom	240-56356396	Earthing and Lightning Protection Standard
Eskom	0.84/3482	Medupi Power Station Earthing Standard
SANS	SANS 62305	Protection Against Lightning
Eskom	240-56355910	Management of Plant Software Standard
Eskom	240-129014618	Generation Cyber Security Compliance Guideline
Eskom	200-16714	Procedure – Commissioning Procedure
Eskom	200-4190	Application for KKS Coding

Eskom	240-56355541	Control System Computer Equipment Habitat Requirements Guideline
Eskom	240-56356411	Fire Barrier Seals for Electrical Cable Installations
Eskom	240-56360034	Stationary Vented Lead Acid Batteries
Eskom	240-56360086	Stationary Vented Ni-Cad Batteries
Eskom	Alpha KKS 01	Alpha KKS 01
Eskom	Alpha KKS 02	Alpha KKS 02
Eskom	PPZ 200-3340	KKS Coding and Labelling Procedure KKS – Procedure
Eskom	N.PSZ 45-45	KKS Key Part Fossil Power Station
Eskom	200-11757	Earthing concept
National Act	Act No. 85 of 1993	Occupational Health and Safety Act
Eskom	240-86973501	Engineering Drawing Standards
Eskom	200-24289 (Ssz_45 17)	Medupi Power Station Corrosion Protection Specification
Eskom	240-71432150	Plant Labelling Standard
	240-93576498	KKS Coding Standard
Eskom	240-53114186	Project/Plant Specific Technical Document and Records Management Procedure
Eskom	240-109607332	Eskom Plant Labelling Abbreviation Standard

APPENDIX H: PROJECT STANDARDS

Adobe Acrobat Document

APPENDIX I: VDSS

Microsoft Excel Worksheet