

Title: **INTERVAL METER DATA
ACQUISITION SYSTEM AND
METER DATA MANAGEMENT
SYSTEM – ENGINEERING AND
FUNCTIONAL REQUIREMENTS**

Unique Identifier: **240-170000884**

Alternative Reference Number: **n/a**

Area of Applicability: **Engineering**

Documentation Type: **Standard**

Revision: **1**

Total Pages: **33**

Next Review Date: **n/a**

Disclosure Classification: **Controlled
Disclosure**

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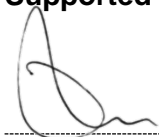
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1. Introduction

Eskom Holdings SOC Ltd (Eskom) is a vertically integrated utility that generates, transmits and distributes electricity. Eskom customer base, through its vast Transmission and Distribution network, includes small power user customers (50kVA and below) and large industrial, commercial and municipal customers (above 50kVA). Eskom, as a member of the Southern African Power Pool, trades energy with other Southern African power utilities. As such Eskom is required by the South African Grid Code to install, maintain and operate metering systems, for the accurate measurement of electricity generation and consumption and the retrieval of such metering data, at all identified metering points.

The National Transmission Company of South Africa SOC Ltd (*Employer*), a wholly owned subsidiary of Eskom, has a number of systems which are currently deployed for the remote retrieval and management of tariff metering data, which forms the basis of revenue collection, and statistical metering data to aid business operations such as the quantification of losses, load forecasting, generation sent outs etc. The Data Acquisition System (DAS) and Meter Data Management System (MDMS) as currently utilised by the *Employer* are broadly classified as follows:

- Automated Meter Reading (AMR) data acquisition systems for the retrieval of tariff interval metering data for large power users including industrial, commercial, municipal, international power utilities, IPPs and statistical interval metering data at various nodes within the Transmission network.
- Transmission MDMS which is a central data repository system that provides long-terms data storage and management of vast quantities of metering data. This data consists primarily of tariff and statistical metering data imported from the AMR systems that manages the data collection. The MDMS stores all the meters data and processes it as required by the various Enterprise applications. The MDMS serves not only as a data repository but an umbrella of services that enable the additional processing (calculations, validation, editing, estimations and analytics).

This document details the request for proposals from the market for an Interval Metering Data Acquisition and Meter Data Management System for the large power user segment of customers in terms of:

- Functional requirements for Interval Meter Data Acquisition System and Meter Data Management System
- Engineering Requirements – Systems sizing, hardware requirements, operating systems, servers etc.

2. Supporting clauses

2.1 Scope

The definition of the *Employers* requirements for a Transmission specific Interval DAS and MDMS for remote retrieval of metering data, validation of metering data, management and processing of metering data and dissemination of metering data from the following categories of meters:

- Generation metering
- International customer metering
- Independent Power Producer (IPP) metering
- Large Power User (LPU) customer metering
- Statistical Metering

The solution shall cater for a main production system(s) within the NTCSA as well as dedicated disaster recovery infrastructure. The solution shall interface with a multitude of communication interfaces, internally using Eskom Telecoms IP and Bandwidth Management Equipment (BME) infrastructure as well as external third-party GSM communications and satellite vendors. The solution shall seamlessly integrate with existing Enterprise systems. The solution shall cater for the migration of the *Employers* data from the existing systems and allow for the transparent operation of the systems during commissioning and system integration.

Tenderers are at liberty to make offers for the retrieval of Quality of Supply data from dedicated power quality instruments or integrated power quality and revenue metering instruments via the Interval Meter DAS. The *Employer* may, at their discretion, elect to implement such functionality.

2.1.1 Purpose

The purpose of this standard is to record the business requirements for Tx DAS and Tx MDMS with a sustainable Interval Meter DAS and MDMS to test the market for either a standalone Interval DAS and standalone MDMS, or an integrated Interval Meter DAS and MDMS through an open enquiry/RFP, to enable optimised purchasing/contracting decisions by NTCSA. This may result in the replacement of the Tx DAS and/or Tx MDMS.

2.1.2 Applicability

This document shall apply throughout Eskom Transmission.

2.2 Normative/informative references

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

2.2.1 Normative

- [1] ISO 9001, Quality Management Systems.
- [2] 240-55410927: Cyber Security Standard for Operational Technology
- [3] 32-373: Information Security - IT/OT Remote Access Standard
- [4] 32-351: Information Security Logical Access Control
- [5] 240-56296995: Standard for Records Retention Periods
- [6] SANS 474: Electricity Metering – Standard Requirements

2.2.2 Informative

- [7] 32-85: Information Security Policy

2.3 Definitions

2.3.1 General

Definition	Description
Analytics	Refers to the business intelligence capability.
Business Continuity	Business continuity encompasses planning and preparation to ensure that an organization can continue to operate in case of serious incidents or disasters and is able to recover to an operational state within a reasonably short period.
Business Intelligence	The term Business Intelligence (BI) refers to technologies, applications and practices for the collection, integration, analysis, and presentation of business information. The purpose of Business Intelligence is to support better business decision making. It can also be described as a broad set of data analysis applications, including ad hoc analysis and querying, enterprise reporting, online analytical processing (OLAP), mobile BI, real-time BI, operational BI, cloud and software as a service BI, open-source BI, collaborative BI and location intelligence.

Definition	Description
Daisy chain	In electrical engineering: Placing several electrical or electronic devices in series by either their power connections or their data connections or both.
Disaster Recovery Plan	A disaster recovery plan (DRP) is a documented process or set of procedures to recover and protect a business IT infrastructure in the event of a disaster. Such a plan, ordinarily documented in written form, specifies procedures an organization is to follow in the event of a disaster. It is "a comprehensive statement of consistent actions to be taken before, during and after a disaster".
ETS	Energy Trading System utilised for financial settlements, billing and invoicing of cross-border energy trading between Southern African Power Pool (SAPP) markets
Generation Production and Sales System	Generation Production and Sales System together with Transmission systems is used to manage the energy management environment. Events, Hourly Loads, Successful Start-ups, Bidding and Trading information are captured by the stations for utilization by the Transmission (National Control), the Trading and Bidding section in Transmission, Generation Production and Sales, Energy Management Data Acquisition System and Generation clusters.
Phoenix	Phoenix is a plant maintenance and monitoring system used in Transmission business. It forms part of the work order management application landscape assisting Transmission grid with energy and performance management.
System	An organized, purposeful structure that consists of interrelated and interdependent elements (components, entities, factors, members, parts etc.). These elements continually influence one another (directly or indirectly) to maintain their activity and the existence of the system, to achieve the goal of the system.
THEMIS	The storage of information related to the power exchange and the calculation of the settlements using this information. The calculations are based on the market rules.
Transmission Metering Data Management System (Tx MDMS)	Collect and verify the actual electricity supplied and delivered at the boundaries of the Transmission network. Currently mostly related to the Distribution-Transmission & International-Transmission borders.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
BME	Bandwidth Management Equipment
CPU	Central Processing Unit
DAS	Data Acquisition System
DMZ	Demilitarized Zone
EMDAS	Energy and Metering Data Acquisition System
EMS	Energy Management System

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ETS	Energy Trading System
GSM	Global Sim for Mobile Communications
IP	Internet Protocol
LPU	Large Power User
MFA	Multi-Factor Authentication
MDMS	Meter Data Management System
OS	Operating System
OT	Operational Technology
SAT	Site Acceptance Testing
SPU	Small Power User

2.5 Roles and responsibilities

Tenderers are to take note of the requirements stipulated in the standard and indicate compliance/non-compliance as stipulated elsewhere in the enquiry/RFP documentation.

2.6 Process for monitoring

As per Transmission documentation management requirements.

2.7 Related/supporting documents

Not applicable

3. Background

3.1 Current NTCSA Metering Systems

Eskom installs various types of meters, to measure energy flows throughout the country and across the borders in neighbouring countries where Eskom has supply agreements. The meters are generally located within the Power Stations, Transmission (Tx), Distribution (Dx), International boundaries and customer sites. All these meters serve multiple purposes. Each division has historically managed its metering data requirements and thus has developed different metering data management strategies and systems.

In Generation, the meters serve to monitor individual and combined power station efficiencies through continuous comparison between generated values and the power delivered to Transmission. The Energy Management Data Acquisition System (EMDAS) at each power station is used to collect the generator unit's metering for the stations operational requirements. Generation Data is then loaded from EMDAS, TEMSE, Tx MDMS into Phoenix and then replicated through to the Generation Power Sales System (GPSS) for operational purposes.

In Transmission, all boundaries where power flows in or through the network, are metered. The metering points are generally located at the High Voltage (HV) side of the generating transformers, the Main Transmission Substations (MTS) and the boundaries with the neighbouring countries. In Transmission, metering installations are on the Medium Voltage (MV) side of Coupling Transformers, as well as on the HV side of Generating Transformers and Station Transformers. All meters installed by Transmission are four-quadrant meters, which are remotely interrogated. Tx metering points are depicted in figure 1 below.

The requirements for metering data include but are not limited to the following:

- 1) Generation output,
- 2) Load forecasting,

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- 3) Interdivisional billing,
- 4) Key customers and international customer billing,
- 5) Independent power producer billing,
- 6) Long term planning,
- 7) Losses calculation and reporting

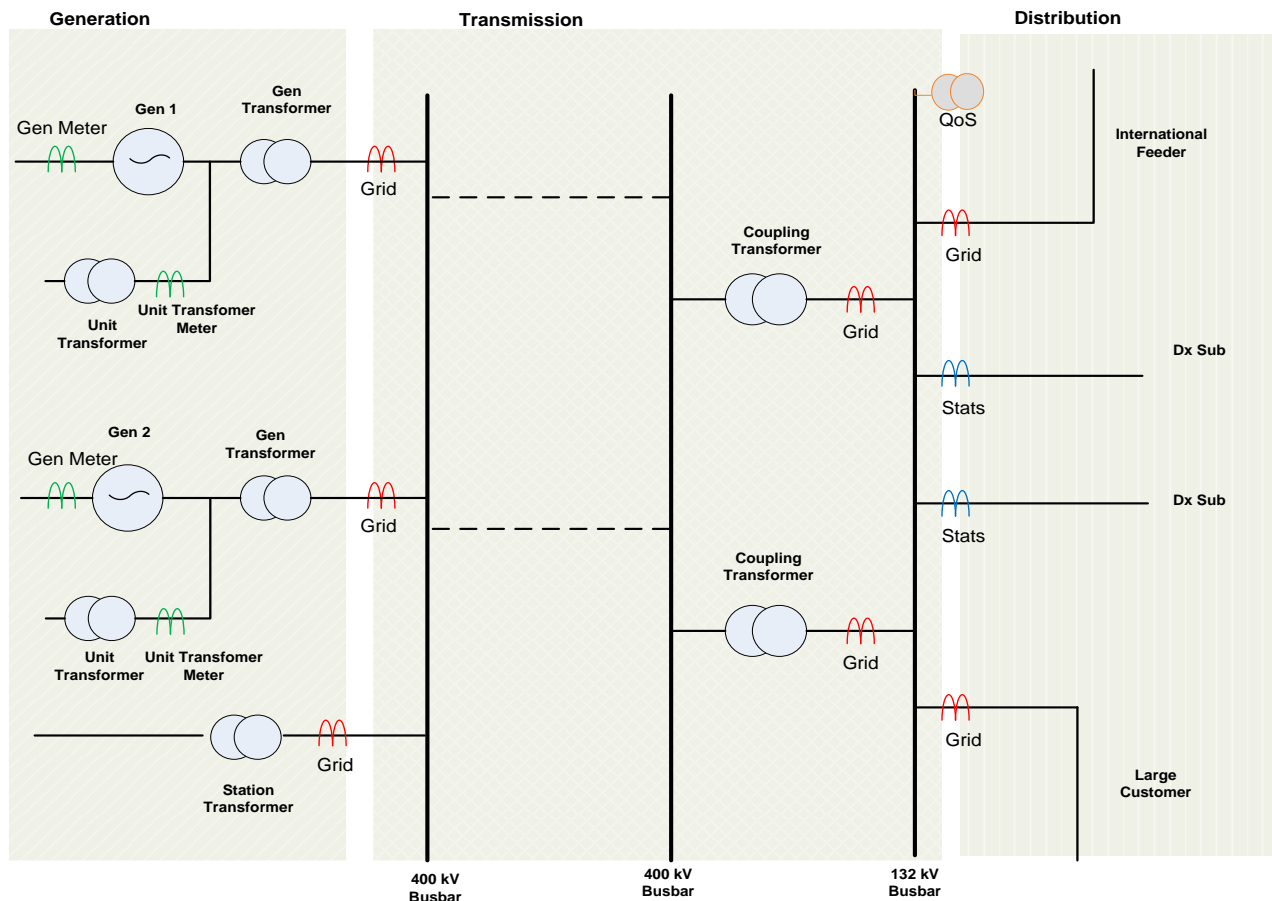


Figure 1: Transmission Grid Metering Points

Grid metering and IPP metering data is currently retrieved via a centralised an automated meter reading (AMR) system which in Transmission's case is the MV90 DAS system and is warehoused within a customized Transmission Metering Data Management System (Tx MDMS). The Tx MDMS is used to ratify billing information, warehouse data and to disseminate metering data to non-Transmission parties and to ancillary Transmission processes, such as those within the System Operator environment. The implementation of protocol-based communication between the grid meters and the SCADA environment at the Generator interface facilitates the provision of operational data to the Power Stations and National Control. The Tx MDMS system was custom developed for Eskom Tx and has been in production since 2005.

The following customers use the Tx MDMS for the following functions:

Customer	Use of Information
Tx (Settlement)	<ul style="list-style-type: none">• Billing of Tx, Gx, and Dx• IPP's and Market Participants• Market settlements calculations
National Control Centre (NCC)	<ul style="list-style-type: none">• Scheduling• Forecasting
Key Sales and Customer Service (KSACS) International Trader	<ul style="list-style-type: none">• Billing of international customers
Dx	<ul style="list-style-type: none">• Losses calculation• Ring-fencing regional consumption• Contracts for differences management• Energy trading
Gx	<ul style="list-style-type: none">• Accounting for the sent out /Tx network infeed• Network balance management by comparing actual against contract values• Scheduling of power stations
Expansion Planning	<ul style="list-style-type: none">• Transmission network planning and investment decision-making
Statistics South Africa	<ul style="list-style-type: none">• Economic growth calculation and statistical record keeping
National Electricity Regulator of South Africa	<ul style="list-style-type: none">• Electricity industry monitoring
Southern Africa Energy	<ul style="list-style-type: none">• SAPP Pool operations and settlements

The Tx MDMS system retrieves data from MV90 and outputs data to Phoenix, Themis and ETS. The diagram below provides a holistic picture of the overall architecture.

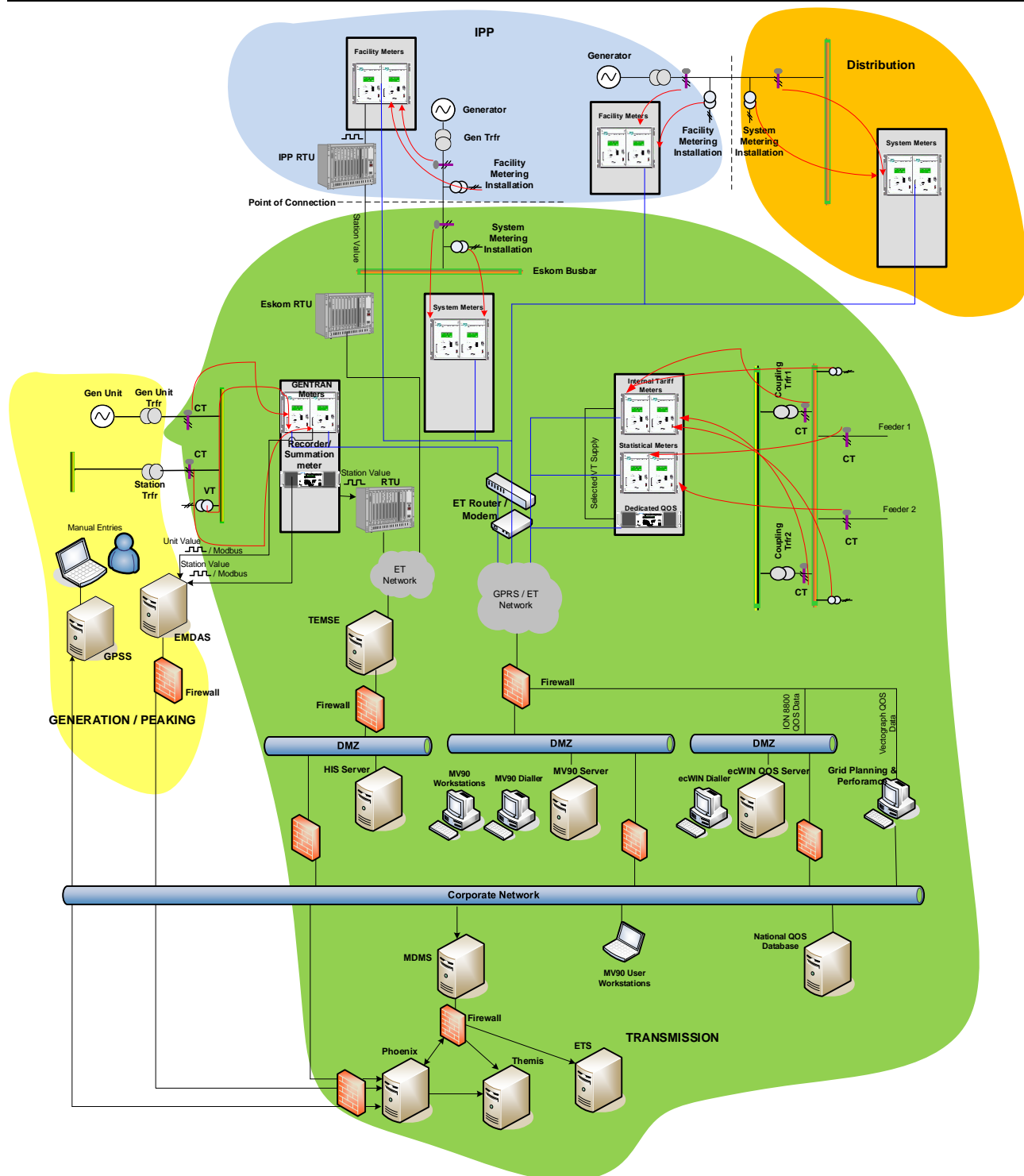


Figure 2: Transmission Metering Architecture

3.2 Philosophy

- a) The replacement Interval Meter DAS and MDMS shall comprise of standard hardware and software with special development kept to a minimum.
- b) Special developments shall be clearly identified and documented as to their nature and depth in the detailed design documentation.

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- c) The Interval Meter DAS and MDMS shall be based on proven Meter DAS and MDMS platforms.
- d) The Interval Meter DAS and MDMS shall be on the supported release for the full duration of the life cycles of the systems which can be facilitated through maintenance contracts as required.
- e) The Interval Meter DAS and MDMS shall maintain the upgradability and modularity to cater for developing requirements of the electricity industry.

4. Engineering Requirements

The Interval Meter DAS and MDMS shall be designed and implemented based on high availability and high reliability.

Suppliers shall provide a detailed architecture of the system(s) including hardware, operating systems, database management systems and application layers to ensure that the design adheres to high availability and high reliability.

The solution shall make provision for disaster recovery environments for both the Interval Meter DAS and MDMS to ensure business continuity. The sites for the disaster recovery systems will be specified by the *Employer* and may not necessarily be the same site for the Interval DAS and MDMS if these are offered as segregated systems.

4.1 Hardware

- a) The *Supplier* shall specify all the hardware infrastructure and components to meet the functional requirements of the Interval Meter DAS and MDMS specified in sections 5 and 6 running on a centralised hosting environment including the following:
 - Minimum workstation specification (CPU, RAM, OS)
 - Database Servers.
 - Application Servers
 - Firewalls and additional hardware performing critical cyber security functions.
 - Details of middleware layers required by the solution
 - Network requirements, including bandwidth requirements and technical specifications
 - Terminal services software, if required.
- b) The hardware design shall include the calculation of CPU processing, power requirements, I/O requirements, network requirements, short-term and long-term storage solutions.
- c) The *Supplier* shall provide a high-level technical deployment diagram and architecture for both the Interval Meter DAS and MDMS. A detailed deployment diagram and architecture shall be provided as part of the detail design.
- d) The proposed hardware for the Interval Meter DAS and MDMS shall be evaluated against the hardware standards of the *Employer*.
- e) The hardware, operating systems and third-party software shall be procured and installed by the *Supplier* with approval from the *Employer*.
- f) The hardware installations shall be verified during the site acceptance (SAT) through the re-installation of the OS and third-party software.
- g) All hardware utilised for the Interval Meter DAS and MDMS shall be supported by local agents.

4.2 Licensing

- a) The Interval Meter DAS and MDMS shall use open-source licences where available.

-
- b) All proprietary licences shall be listed and the licensing model in respect to the licence shall be documented.
 - c) All third-party software licences shall be separately / individually listed
 - d) Patches and updates shall be available for all licensed software.
 - e) Third-party licences delivered by the *Supplier* as part of the Interval Meter DAS and MDMS solution shall be managed by the *Supplier*. The *Employer* shall not be required to enter into additional contracts or agreements to source and manage third-party licences.
 - f) The *Employer* retains the right to utilise existing corporate software and hardware licences and maintenance agreements in adherence to the *Employers* policies and standards.
 - g) The *Supplier* shall stipulate all annual license requirements if applicable.

4.3 Disaster Recovery Requirements

The system shall support the back-up and disaster recovery requirements according to following Eskom's standards:

- a) 32-385: IT continuing/ Disaster Recovery (DR) standard
- b) 240-79747329: Standard for business continuity management
- c) 240-47615255: Eskom IT disaster recovery strategy

In addition, the system shall comply with the following disaster recovery and availability requirements:

- d) System recovery time of less than 24 hours
- e) Have physically isolated production and disaster recovery environments
- f) Automatically replicated to a disaster recovery site and be set up such that it switches automatically between the operational and the Disaster Recovery (DR) as the need arises.

4.4 Security

As per Eskom's Information Security Policy (32-85), Information Resources are Eskom's critical assets requiring a high level of protection. Sufficient measures commensurate with the risk shall be taken to protect these Information Resources against accidental or unauthorised modifications, disclosure, and/or destruction, as well as to assure the confidentiality, integrity, and availability of Eskom's Information Resources.

The purpose of the Information Security Policy (32-85) is to minimise the following risks and exposure:

- Data integrity, availability, and confidentiality being compromised
- Breach of confidentiality
- Breach of legislation or non-compliance with regulatory or ethical standards
- Loss of, or damage to, equipment
- Connection of divisions' systems to uncontrolled environments
- Reputational risk
- Financial loss through loss of confidential Eskom information
- Excessive access levels, unsecured connections, and poorly secured third-party connections

4.4.1 Cyber Security Requirements

- a) Security shall be aligned to the requirements from the Cybersecurity Framework from the National Institute of Standards and Technology (NIST) and supplemented by the North American Electric Reliability Corporation (NERC) on critical infrastructure protection supplemented by ISO/IEC 27002.

- b) The system shall comply to the following policies and standards:
- 240-55410927: Cyber Security Standard for Operational Technology
 - 32-373: Information Security - IT/OT Remote Access Standard
 - 240-91479924 Cyber Security Configuration Guidelines of Networking Equipment for Operational Technology
- c) System to be fully NERC CIP compliant, including the delivery and implementation of the configuration of parameters throughout the 7 layer OSI model.
- d) All communication links, with no existing hardware limitations, shall be encrypted.
- e) Application whitelisting shall be installed and configured on all servers and workstations.

4.4.2 Remote Access Security

- a) Remote access to the Interval Meter DAS and MDMD shall be restricted, and it shall only be granted to users who have been identified and verified and have appropriate information security clearance as may be deemed appropriate by the relevant information manager.
- b) Multi-factor authentication (MFA) shall be used for remote access via dual Virtual Private Networks (VPN) to the Operation Technology DMZ
- c) Remote access shall only be provided via remote access facilities that are approved by Eskom.
- d) All connections between Eskom internal networks and the Internet (or any other publicly accessible computer network) shall include an approved firewall.
- e) *Suppliers* are to ensure that the system(s) architecture comply with the Eskom Remote access IT and OT standard number 32-373.

4.5 Software Configuration Management

- a) All software developments shall always follow a structured system development methodology.
- b) Formal change control procedures shall be utilised for all amendments to systems.
- c) Any changes to routine systems operations are to be fully tested and approved before being implemented.
- d) During the maintenance contract period, necessary upgrades and patches to the systems shall have the associated risks identified and be carefully planned, incorporating tested fall-back procedures.
- e) During the maintenance contract period, post-implementation reviews shall be conducted for new or significantly changed application systems.
- f) *Employer's* data used for testing purposes shall be protected and controlled.

4.6 Training

Training shall be provided to ensure that the *Employer* can fulfil its responsibilities during the initial commissioning of the system(s), operation of the system(s) and maintenance of the system(s)

The *Supplier* shall ensure that the following training requirements are provided:

- a) Users to be trained to access and use all Meter Data acquisition system and Meter Data Management system functionalities as per their user-defined roles (basic training)
- b) Eskom support staff to be trained to enable them to deliver advanced system support (specialised training)
- c) Training activities and training material shall be supplied and provided by the *Supplier* in English.
- d) All documentation provided during training shall be available online

- e) A detailed list of all the training and the contents thereof shall be provided at time of tender/proposal.

4.7 Support/Maintenance Contract Proposal

The support of the Interval Meter DAS and MDMS system forms an integral part of the sustainability of the systems during their life cycle. As such *Suppliers* are required to propose a maintenance contract in order to sustain the system in terms of software upgrades, possible expansion, engineering support and training.

5. Interval DAS Functional Requirements

5.1 System Access

Access to the system shall be managed as follows:

- a) Ability to synch with active directory or Microsoft Azure
- b) Fully accessible via Web services on both sides
- c) Capability to create username and profile
- d) Ability to configure user access profiles in compliance with Eskom security policy 32-85
- e) Capability to activate / de-activate user accounts.
- f) Generate end user access reports.
- g) Full Audit trails and record keeping of all changes made on the system (configuration and data)
- h) Monitoring login and be able to automatically disconnect users if they have not logged in for a while (user access management)
- i) Ability to create access reports

5.2 System Access Requirements

The system shall provide for the following access types and roles:

- a) Basic User - Access to view and download
- b) Advanced user - Access to read and write
- c) Super user - Full access to read, write and the ability to override a check out e.g. if a user is ill or in the case of emergency
- d) Administrator - Ability to add/remove user access and manage the system
- e) View only access - To allow users to view only

5.3 Meter Configuration

The system shall facilitate the registering, de-registering, commissioning, and decommissioning of meters.

- a) The system shall have the ability to automatically synchronize and maintain relationships for the meter configuration information i.e., customer information, meter information and meter channel information between the DAS and the MDMS.
- b) Meter configuration synchronization between the DAS and MDMS shall automatically take place during the registration, deregistration, commissioning and decommissioning of meters on the DAS.

The system shall have the capability to register/configure and setup a meter. The solution must make provision for the following configuration fields:

1) Customer Information

- Customer Name
- Unique customer ID
- Account Number
- Premise ID
- Miscellaneous text fields

2) Meter Information

- Device ID
- Device type
- Meter Location
- Meter passwords
- Integration periods to be read
- Meter Status (whether is active or not)
- Daisy chain configuration
- Communication authentication detail (communication medium, cell numbers, IP addresses etc.)
- Global Positioning System (GPS) Coordinates
- Meter serial number

3) Meter Channel Information

- Channel Numbering
- Unit of measure for channel
- Meter constants/k-factor/multiplier
- Minimum and maximum values for each channel
- Register reading for each channel

4) Aggregation

- Aggregation ID
- Name
- Meter(s) to be linked
- Meter channels to be linked
- Aggregation type
- Miscellaneous text field for comments

5.4 Data Collection

- a) The system shall be a fully automated multi-vendor meter data collection and management system.
- b) The system shall be compatible with Eskom current approved meters and any other legacy meters installed
- c) The list of Eskom approved meters are:
 - Honeywell Elster A1700 meter 1 & 5A meters
 - Landis + Gyr ZMD 1& 5A meters
 - Landis + Gyr ZMG 1&5A meters
 - Landis + Gyr ZMQ 1A meters
 - Landis + Gyr 125A & 160A meters
 - Landis + Gyr ZMC 1&5A meters
 - Strike Enermax meters
 - Schneider ION 8800 meters
 - Landis+Gyr FAF 11/ 12/ 22 recorders
 - Landis+Gyr FBC encoder
 - CEWE Prometer
- d) The system shall be compatible with any new future meters Eskom approves. The *Supplier* is required to state how the protocols for new meters are sourced from meter manufacturers and the drivers implemented on their DAS.
- e) The system shall support, at minimum DLMS compliant meters.

5.5 Remote Meter Reading (Scheduled and on demand)

The system shall have the capability to remotely interrogate meters (scheduled and on demand) as follows:

- a) The system shall be flexible to read meter load profile data in 1, 5, 15, 30 and 60-minute intervals (must be in energy quantities kilowatt-hour (kWh), kilovar-hours (kvarh) for both import and export). The interval setting should not be a global setting.
- b) The system shall have the capability of remotely interrogating all meters on a daily basis, with the exception of Generation meters which are to be interrogated on an hourly basis
- c) The system shall make provision for data being pushed from the meter on a near-real time basis as opposed to meter data being retrieved from the meter via polling the meter.
- d) The system shall have the capability to read, store and verify meter data
- e) Read second load profile data other than the energy values (e.g. Voltage, Current, etc.)
- f) Read and store registers of each meter channel.
- g) Read and store cumulative energy registers from meters.
- h) Read and verify meter device ID
- i) Read, compare and set remote meters time with system time
- j) Read, store and identify meter alarms/warnings
- k) Read, store and identify meter events.
- l) Keep a log of all (system and user) interrogations performed.
- m) Allow for remote time-set both for scheduled and on demand

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- n) Capability to allow option to read all or partial meter data
- o) Ability to support daisy chain interrogations

5.6 Validation and Verification Capability (Scheduled and on demand)

The system shall have the following verification and validation capabilities (scheduled and on demand)

- a) Verify retrieved intervals with expected interval
- b) Main and check meter validation (scheduled and on demand)
- c) Main and check meter aggregation with customizable comparison criteria
- d) Customizable high and low limits on load profile data
- e) Option to retry failed interrogations (scheduled and on demand)
- f) Flag and identify critical meter alarms and events on the load profile data
- g) Validate meter time tolerances against system time
- h) Keep a log of all validations performed
- i) Option to export validation reports to comma-separated values (CSV), Microsoft (MS) Office Excel and Portable document format (PDF) file formats
- j) Flag edited / estimated profile data
- k) Flag change in constants / meter multipliers
- l) The system shall have the capability of providing standardised but configurable validation rules and exception handling.

5.7 Load and Demand Profiling

The system shall have the capability of supporting load and demand profiling – read of the meters. The system shall be flexible to handle profile intervals of 1, 5, 10, 15, 30 and 60 minutes for the two profiles below with the added flexibility of configuring the channels orders differently for different applications:

- a) Load Profile 1 data – billing quantities (6 channels)
 - kWh Import
 - kWh Export
 - kvarh Quadrant 1
 - kvarh Quadrant 2
 - kvarh Quadrant 3
 - kvarh Quadrant 4
- b) For metering applications where Line Loss Compensation is applied, the system shall have the capability of supporting load profile data for both compensated and uncompensated data recorded by the meter i.e. Load Profile 1 data – billing quantities (12 channels)
 - kWh Import - uncompensated
 - kWh Export - uncompensated
 - kvarh Quadrant 1 - uncompensated
 - kvarh Quadrant 2 - uncompensated
 - kvarh Quadrant 3 - uncompensated
 - kvarh Quadrant 4 – uncompensated

- kWh Import - compensated
 - kWh Export - compensated
 - kvarh Quadrant 1 - compensated
 - kvarh Quadrant 2 - compensated
 - kvarh Quadrant 3 - compensated
 - kvarh Quadrant 4 – compensated
- c) For Generation Peaking applications where the meters are required to store profile data based on the Generator mode of operation i.e. Generating, pumping, SCO and standstill, the system shall have the capability of supporting load profile data for the different modes of operation i.e. Load Profile 1 data – billing quantities (upto 12 channels)
- Generating kWh Import
 - Generating kvarh Quadrant 3
 - Generating kvarh Quadrant 2
 - SCO kWh Export
 - SCO kvarh Quadrant 1
 - SCO kvarh Quadrant 4
 - Pumping kWh Export
 - Pumping kvarh Quadrant 1
 - Pumping kvarh Quadrant 4
 - Standstill kWh Export
 - Standstill kvarh Quadrant 1
 - Standstill kvarh Quadrant 4
- d) Load Profile 2 data - engineering quantities (minimum of 12 channels)
- Voltage
 - Current, etc.
- e) The Interval Meter DAS shall also be capable of maintaining multiple profile intervals for different load profile data applications e.g. 30 minute intervals for load profile data relating to billing quantities and 10 minutes intervals for load profile relating to engineering quantities.
- f) Ability to read meter registers

5.8 Data Aggregations (Scheduled and on demand)

A key function of the Interval Meter DAS is to aggregate meter data for purposes such as billing, reporting and analysis. The system shall perform the following Aggregations functions (both scheduled and demand):

- a) Support complex aggregation needs to include meter totalization and subtraction.
- b) Averaging between main and check metering
- c) Summarizes the meter channels used for billing purposes
- d) Creation of virtual meter points, where no physical meter exists, through aggregation and/or subtraction of data.

-
- e) Store the versions of data used to perform aggregation. If a version of data for a meter is updated which is part of an aggregated set of data, the DAS shall flag the data as outdated and schedule it for re-aggregation.

5.9 Data Estimations and Editing

The system shall have the capability to support data estimations and editing as follows:

- a) Estimate by copying data from another meter
- b) Estimate by applying a multiplying factor to any channel
- c) Estimate by other means such as average day/month
- d) Estimate by importing data from a text or Excel file
- e) The system shall retain earlier versions of the data for auditing purposes.
- f) Metering data that has been estimated in the Interval Meter DAS must be flagged as estimated and sent through as flagged data to the MDMS
- g) The Interval DAS shall have the capability to create, split and combine files for estimations

5.10 Data Exporting

The system shall have the capability to export data to the MDMS (scheduled and on demand) as follows:

- a) Meter data that is remotely interrogated and validated shall be automatically exported to the MDMS daily, except for Generation data or any other data sources identified in the future, which shall be exported on an hourly basis.
- b) The data export file format shall be an industry accepted file format that can easily read and interpreted by any MDMS.
- c) The system shall keep a log of all data files exported
- d) *Supplier* to specify the formats in which the data is transferred from Data acquisition system to the MDMS and the expected data transfer rates.

5.11 General Requirements for Interval DAS

- a) The system shall have the capability to perform prioritised remote interrogations, data validations, aggregations, and data exports on a scheduled and on demand basis.
- b) The following configuration requirements can be provided for as a global or local setting:
 - Frequency of remote interrogations
 - Frequency of data validations
 - Frequency of aggregations
 - Frequency of data exports
 - Frequency of performance management and exception reports
- c) Ability to make provision of executing the remote interrogations, data validations, aggregations, data exports, consumption, and exception reports in the following manner:
 - Per installation/instance
 - All installations/instances
 - Batches
 - Any other distinct form

d) Capability to export reports in the following format

- Excel
- CSV
- Text
- Using a compressed/compact file format
- PDF

5.12 System Time Synchronisation

- a) The system shall have the ability to maintain system time synchronization across all devices to ensure accuracy of data.
- b) The solution should automatically synchronize meter time. The tolerance level or window (upper and lower limit) should be configurable
- c) Data Acquisition System must be able to synchronize to external standard time

5.13 Meter Alarming and Events Reporting

- a) The System must be able to interrogate and interpret meter alarms and events correctly
- b) In addition, the DAS shall have the ability to be configured to interrogate and interpret new meter type of alarms and events.
- c) At minimum, the following alarms shall be read from the meters:
 - Phase fail alarms
 - Power failure alarms (power down, power up)
 - Clock adjustment
 - Meter system failure alarms (battery failure, profile memory access failure, etc.)
 - Short and Long intervals
 - Power outage

5.14 Performance Management and Exception Reports

The system shall provide the following performance management and exception reports:

- a) Dial out performance reports that identify the type of failures
- b) Data validation reports
- c) Aggregation performance reports
- d) Exported file performance reports
- e) Meter time tolerance reports
- f) Data edits/estimates performed
- g) Data availability/upload reports
- h) Consumption reports
- i) kVA analysis reports.

5.15 Audit Trails

- a) The Interval Meter DAS shall have the capability to complete an audit trail for all meter data to record events involving the processing of data.
- b) As a minimum, the Interval Meter DAS shall track how, when, and why a change was made to the metering data and identify the person or process that performed the change.
- c) The Interval Meter DAS shall make this information available in a form that supports an end-to-end audit of data retrieval from the meter to preparation of data to be sent to the MDMS. For example, if a bill is disputed, the Interval Meter DAS shall be able to identify the raw data that was used to create the billing quantity data provided for use in the calculation of the bill.
- d) The Interval Meter DAS shall provide a mechanism to enable the identification of meter data that has been edited or estimated, including the capability for users to enter comments to describe the nature of the edits made.
- e) The Interval Meter DAS is expected to use actual data to replace estimates and edits, once available. All new data shall be processed through validations, estimations and editing.

5.16 Basic Data Analysis

- a) The solution must be able to provide for data analysis tools. The data analysis tool shall be able to represent the data in a graphical format.

5.17 Data Storage

- a) The Data Acquisition System should be able to configure, interrogate and store data for 3 000 Meters.
- b) However, the DAS should be scalable to be able to handle a maximum amount of 15 000 Meters.
- c) DAS shall have the capability to store all metering data (raw and official metering data) for a minimum period of 5 years.
- d) The data should be stored internal to Eskom on a server

5.18 Integration with Enterprise Systems

- a) Capability to integrate with the following business systems:
 - To align with Eskom MDMS integration using CIM IEC 61968-9
 - Eskom Integration Bus which is currently Oracle Data Fusion

5.19 Communication Infrastructure

- a) The DAS shall have the capability to connect via serial, Ethernet, WAN, etc. with Eskom's meters through the following communication mediums. The communication mediums itself would be managed and provisioned by Eskom.
 - Circuit Switched Data (CSD)
 - General Packet Radio Service (GPRS)
 - Long Term Evolution (LTE)
 - TCP/IP
 - Fibre
 - Microwave links
 - Satellite
 - Any future communication medium

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- b) Ability to handle multiple meter interrogations simultaneously and on the same network.
- c) Eskom currently makes use of pull technology where the Data Acquisition system interrogate the meters. The solution should support both pull and future push technology (where the meters push its data to a remote server or Data Acquisition System)
- d) The DAS shall be able to facilitate daisy chaining where it is defined as the ability of the DAS to address several meters remotely after each other for which the communication is wired in series either through means of a modem or WAN.

5.20 Direct Importing of Data

- a) The system shall have the capability for direct importing of data (manipulated data or in a text file format).
- b) *Supplier* to specify the format for importing of data into the DAS
- c) The system should include modules / portable version of the DAS that can be used to manually download meters that cannot be reached due to communication failures or do not have remote communication facilities. These modules / portable versions of the DAS shall be deployed on laptop computers or other portable computing services (e.g. tablet computers) running a Microsoft Windows operating system.

5.21 Data Retention and Archiving Requirements

- a) The information created and stored by Eskom's information systems shall be retained for a minimum period that meets both legal and business requirements, as prescribed in the formal procedure.
- b) Day-to-day electronic information retention shall ensure that past and current business information is readily available to authorised users and that archives are both created and accessible in case of need.
- c) The system shall have the capability to store all metering data (raw and official metering data) for a minimum period of 5 years.
- d) The Interval DAS shall have the capability to create, split and combine files for estimating archived data.

5.22 Reporting Requirements

The system shall at minimum provide for the following high-level reports:

Table 1: High level reports

Number	Report Name	Functionality
5.22.1	Dial out performance reports that identify the type of failures	Daily report indicating: <ul style="list-style-type: none">all type of failures
5.22.2	Data validation reports	Daily report indicating: <ul style="list-style-type: none">data validations
5.22.3	Aggregation performance reports	Daily report indicating: <ul style="list-style-type: none">aggregation performance
5.22.4	Exported file performance reports	Daily report indicating: <ul style="list-style-type: none">exported files
5.22.5	Meter time tolerance reports	Daily report indicating: <ul style="list-style-type: none">time tolerance

Number	Report Name	Functionality
5.22.6	Data edits/estimates performed	Weekly and Monthly report indicating: <ul style="list-style-type: none">data edits/estimates
5.22.7	Consumption reports	Ad hoc report indicating: <ul style="list-style-type: none">customer consumption
5.22.8	kVA analysis reports	Ad hoc report indicating: <ul style="list-style-type: none">analysis

6. Meter Data Management System Functional Requirements

6.1 System Access

Access to the system shall be managed as follows:

- Ability to synch with active directory or Microsoft Azure
- Fully accessible via Web services on both sides
- Capability to create username and profile
- Ability to configure user access profiles in compliance with Eskom security policy 32-85
- Capability to activate / de-activate user accounts.
- Generate end user access reports.
- Full Audit trails and record keeping of all changes made on the system (configuration and data)
- Monitoring login and be able to automatically disconnect users if they have not logged in for a while (user access management)
- Ability to create access reports

6.2 System Access Requirements

The system shall provide for the following access types and roles:

- Basic User - Access to view and download
- Advanced user - Access to read and write
- Super user - Full access to read, write and the ability to override a check out e.g. if a user is ill or in the case of emergency
- Administrator - Ability to add/remove user access and manage the system
- View only access - To allow uses to view only

6.3 Meter Configuration Management

- The MDMS shall store all synchronization logs between the DAS and MDMS.
- The MDMS shall support the synchronisation of meter configuration information to Tx back-end system viz. Themis, Phoenix, ETS and Meter Asset Management System.
- The MDMS shall store all synchronization logs between MDMS and Themis, Phoenix, ETS and Meter Asset Management System.

6.4 MDMS Mapping Management

The MDMS shall have the facility to setup customers, subdivide them into special groups, create relationships between meters, customers, regions and groups and assign access to these groups through appropriate mapping management. As a minimum the MDMS shall cater for the following account management functions through a hierarchical structure:

- a) Regions - Segregating Customers / Substations into various regions based on their physical location.
- b) Customers - Customers, typically in a Transmission environment refers to a substation. Customer mapping shall include the various metering points and associated meters, mapping configuration for the derivation of official and totalised values based on a pre-defined set of business rules.
- c) Groups – Segregation of customers / regions into various groups. Users can be assigned to different groups

6.5 Interval Meter DAS Data Collection and Processing

Interval, register and event data are to be retrieved from the various meters by the Interval Meter DAS. The Interval Meter DAS shall perform first line validation to confirm the quality of the data extracted from the meters, using a host of user selected verification criteria.

- a) The MDMS shall accept data exported by the Interval Meter DAS (scheduled and on demand).
- b) The MDMS shall automatically accept exported data from the Interval Meter DAS daily, except for Generation data or any other data sources identified in the future, which shall be imported on an hourly basis.
- c) The number of channels on which meter data is collected should not be a set values, but rather configurable based on the meter capability.
- d) The MDMS shall accept data in the file format supported by the Interval Meter DAS.
- e) *Supplier* to specify the formats supported by the MDMS.
- f) The system shall keep a log of all data files imported from the Interval Meter DAS.
- g) The MDMS shall check the syntax of each data transfer that is receives from the DAS. This can be expected to include checking that the data structure is consistent with the required standards and that any checksum values provided with the MDMS checksum calculations.
- h) The MDMS shall perform a checksum calculation in the data that is received, compare the results to the original checksum, and conclude that the message was not corrupted if the sums match.
- i) The MDMS shall immediately perform 2nd line verification and validations, according to specified rules once the data is imported from the Interval Meter DAS.
- j) The MDMS shall have the capability of identifying estimated data retrieved from the Interval DAS and provide a prompt for the manual acceptance by an authorised user. All estimated data shall be flagged.
- k) The MDMS shall provide a platform for the comparison of data retrieved via the Interval Meter DAS against alternative sources of data i.e. Phoenix and existing TEMSE (or future replacement Energy Management System).

6.6 Data Transfer Timeline

The data loaded into the MDMS on each day will mainly be for the previous day Daily Read Period. Some data transfers will be expected for other days where, for example, there was a communication problem between the Interval DAS and a specific meter and the Interval DAS was unable to send the data previously and is now only transmitting data from several days before.

In addition to the data loaded each day, certain categories of metering installations viz. Generation meters, for which data is required by various stakeholders on a frequent basis for operational purposes are to be loaded to the MDMS every hour.

Daily metering data loaded into the MDMS will include data that is undergoing validation checks and aggregation into billing quantities. These processes are briefly outlined in figure 3 below. Note that as many as seven days may elapse between receiving the meter reads for a customer and creating official meter that has completed all validations, estimations, and aggregations.

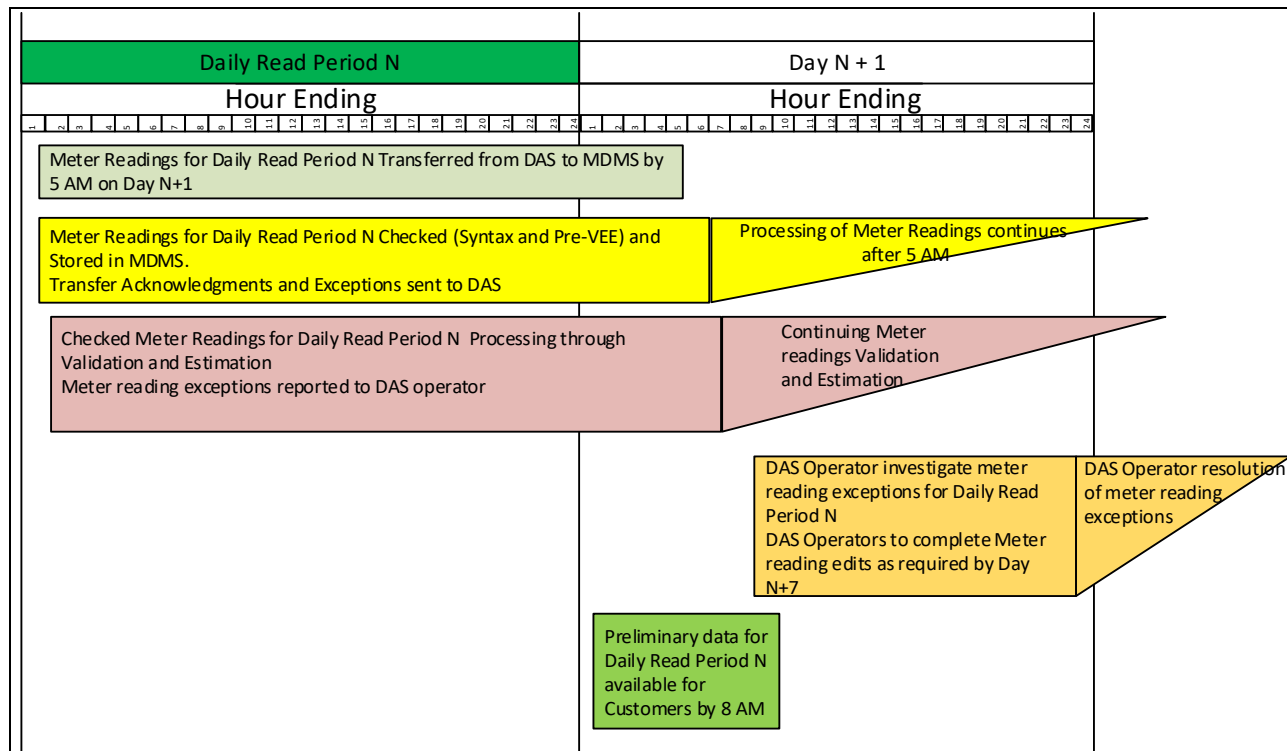


Figure 3: Data Transfer Timeline

The previous day preliminary metering data or hourly Generation data may be required to be provided to the customer / stakeholders by a certain time during the day or within 10 minutes after the hour in the case of Generation data. Data based on meter reads that have not passed validation, has been estimated, or has been edited shall include a notice to that effect when presented.

6.7 Non – Interval Meter DAS - Related Data Transfers from Energy Management System/Phoenix to MDMS

The MDMS shall be capable of receiving data on an adhoc basis from sources other than the Interval Meter DAS in cases where meters have not been commissioned or for purposes of validating Interval Meter data against the current TEMSE (SCADA data) or replacement Energy Management System. The MDMS shall provide for adhoc retrieval of data from Phoenix/EMS

- Retrieval of data from Phoenix, in the event of total loss of data from the Gentran meters or if the meters have not been commissioned.
- Retrieval of data from EMS, per metering point, for validation against Interval Meter DAS profile data.
- Data retrieved from Phoenix / EMS shall be flagged indicating the source of the data
- The MDMS shall keep a log of all files received from Phoenix / EMS.
- MDMS shall have the capability to graphically compare EMS / Phoenix data

6.8 Data Storage

- a) The MDMS shall receive and store all load profile, register reads and event data from the Interval Meter DAS.
- b) The MDMS shall support the storing of load profile data relating to billing quantities as well as load profile data relating to engineering quantities viz, voltage, current, power factor etc. as received from the Interval Meter DAS
- c) The MDMS shall have the capability of supporting load and demand profiling in intervals of 1, 5, 10, 15, 30 and 60 minutes.
- d) The MDMS shall also be capable of maintaining multiple profile intervals for different load profile data applications e.g., 30-minute intervals for load profile data relating to billing quantities and 10- minutes intervals for load profile relating to engineering quantities.
- e) The MDMS shall support the storage of aggregated data as received from the Interval Meter DAS.
- f) The MDMS shall support changes over time in the size of an interval over which meter data is collected for any customer such as a change in interval size for one or more meters e.g., from 30 minutes to 15 minutes

6.9 Data Aggregation

A key function of the MDMS is to aggregate meter data for purposes such as billing, reporting and analysis

- a) The MDMS shall support data aggregation i.e. totalisation and subtraction of data from multiple devices and/or multiple channels.

The MDMS shall at minimum support the following data aggregation and calculations based on current business rules. However the MDMS shall have the capability of supporting alternative aggregation methodologies to cater for changes in business processes based on developing requirements of a dynamic electricity industry.

Official Data Calculation

- b) Main meter data is to be used as the official data by default. In the event of unavailability of main meter data the check meter data will be used as the official data.
- c) The MDMS must have the capability to overwrite the check meter data as the official meter data when the main meter data becomes available.
- d) Official data is to be utilised for aggregation of data to provide totalised values relating to the various customers based on the mapping configuration. The business rules relating to the mapping configuration and totalised values are to be defined at a later stage.
- e) The MDMS shall summate the individual power station unit values to obtain a user defined power station sent out value on an hourly basis
- f) The system shall have the capability of viewing and downloading (excel) all Official, Total, Main or Check data either per interval, hourly, aggregated monthly or by a user defined period.

Losses Calculation

- g) The MDMS shall have the capability of calculating Transmission system losses based on official metering data utilizing the following formula:
$$\text{Tx Losses} = (\text{GEN (imports)} + \text{INT (Imports)} + \text{Tx IPP (Imports)}) - (\text{Pumping (Exports)} + \text{SCO (Exports)} + \text{INT (Exports)} + \text{DX (Export- Import)} + \text{GEN (Exports)} + \text{Tx IPP (Exports)} + \text{Tx STN TRFR (Exports-Imports)})$$
- h) The MDMS shall have the capability of supporting alternative calculation methodologies to cater for changes in business processes based on developing requirements of a dynamic electricity industry.

KVA Calculation

- i) The MDMS shall have the capability of calculating the KVA and power factor on an official and totalized level for a particular interval or period. The formula utilized for KVA calculations is to be defined by the *Supplier* but adaptable to changing business processes and requirements.

Data comparison

- j) The MDMS shall provide a graphical tool for the comparison of the Total, Official, Main, Check and current TEMSE / future replacement EMS data per meter point and per interval as well as hourly.
- k) The MDMS shall provide for percentage variance calculation with graphical representation between main and check meters as well as between the official and current TEMSE / future replacement EMS data for a specified period.

6.10 Data Dissemination

There are two categories of data transmission between the MDMS and the various end-user / stakeholder systems utilised for billing and settlements as follows:

- Automatic meter data transmission at pre-determined, user specified intervals. The intervals may vary from hourly in the case Generation unit and station values to daily for normal billing and settlement applications.
- Specific metering data transmitted in response to a request

The automatic dissemination of official metering data to the various end-users / stakeholder systems, in the format required by the various systems, for billing and settlements shall be as follows:

- a) Wholesale Settlements (IPPs)
- IPP energy, consumption and production metering data must be sent from MDMS to Themis, on user-specified interval, to perform the necessary calculations to determine wholesale settlements.
- b) Energy Trading (Exports and Imports)
- International export and import data must be sent from MDMS to Themis, on a user-specified interval, for billing purposes.
 - International import data must be sent from MDMS to Phoenix, on a user-specified interval, for National Control load forecasting purposes.
 - International export and import data must be sent from MDMS to ETS, on a user-specified interval, for settlements with SAPP energy trading partners.
- c) Internal Settlements
- Unit and station values (Hourly) as well as MTS (Daily) tariff data must be sent from MDMS to Themis.

The MDMS shall have the flexibility to support the cancel/rebill process where the MDMS shall send new metering data the next day or the next billing cycle for any metering point. If a cancel/rebill metering data is required sooner this shall be provided by the MDMS in response to a request.

The MDMS shall keep a log of all files transferred to Phoenix, Themis and ETS.

6.10.1 Data Dissemination based on Requests from End-User Systems

- a) The MDMS shall respond to inquiries from the various end-users / stakeholder systems on an ad-hoc and regular basis. It is expected that such inquiries will be constructed from predefined parameters, to be developed as part of the MDMS business processes. Some examples of such inquiries include:

- A request for historical data for a specific metering point or group of metering points for a specific time period.
 - A request for aggregated data relating to a set of pre-determined meters per Grid, Dx cluster / Operating unit.
- b) The MDMS shall respond to the end-user / stakeholder request for information to complete final billing, as an example, in addition to information to allow them to meet their ongoing billing requirements
- c) The MDMS shall respond to inquiries for authorised parties. Authorisation for access to metering data shall be controlled by the primary entity authorised for granting data access
- d) The MDMS may be required to limit ad-hoc inquiries during heavy data processing periods such as month-end billing periods. As necessary, the MDMS shall provide functionality to enforce this requirement or shall provide access to data using a mechanism that does not affect operational processes.
- e) In addition, the MDMS shall provide a web-based interface for registered end-users to stakeholders to view their respective energy data.

6.11 Audit Trails

- a) The MDMS shall have the capability to complete an audit trail for all meter data to record events involving the processing of data.
- b) As a minimum, MDMS shall track any activity of changes made to metering data, specifically the acceptance of estimated data, when the activity occurred and identify the person or process that performed the activity.

6.12 Reporting Requirements

The MDMS shall as a minimum provide for the following reports and shall have the capability of downloading the reports to Excel and PDF.

Number	Report Name	Functionality	Frequency	Data Source
6.12.1	Dial out success rate log / Remote Interrogation log	What meters were successfully dialled vs what meters did not dial.	<ul style="list-style-type: none"> Daily and monthly Gx meters hourly 	Interval Meter DAS
6.12.2	Data validation reports	Results of 1 st line validation performed <ul style="list-style-type: none"> Files accepted vs rejected 	<ul style="list-style-type: none"> Daily and monthly Gx meters hourly 	Interval Meter DAS
6.12.3	Interval Meter DAS upload log	Provide status of files uploaded from Interval Meter DAS to MDMS	Any time of day	MDMS
6.12.4	Data Availability Report	Provide main and check meter data availability per meter point, group of meter points, region etc <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Daily 	MDMS
6.12.5	Official Report	Provide information indicating which meter was used as the official meter for that period	<ul style="list-style-type: none"> Daily Gx meters hourly 	MDMS

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Number	Report Name	Functionality	Frequency	Data Source
6.12.6	Losses Report	Provide losses per interval utilising sent outs, international imports and exports, pumping, Dx exports etc <ul style="list-style-type: none"> Energy imported into the network minus energy exported out of the network 	<ul style="list-style-type: none"> Monthly Ad-hoc 	MDMS and Phoenix
6.12.7	Gx Data Availability Report	Provide hourly metering data per power station <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Hourly 	MDMS, TEMSE and Phoenix
6.12.8	International Daily Status Report	Provide data availability for international meters <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Daily 	MDMS
6.12.9	International Monthly Billing Report	Provide the complete dataset status for international meters <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Monthly 	MDMS
6.12.10	IPP Weekly Data Availability Report	Provide weekly metering data for IPPs <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Weekly 	MDMS
6.12.11	IPP Monthly Billing Report	Provide the complete dataset status for IPP meters <ul style="list-style-type: none"> Data available vs not available vs partial available vs estimated 	<ul style="list-style-type: none"> Monthly 	MDMS
6.12.12	Data Comparison (Main vs Check)	Provide a comparison (Per interval, Daily and selected period) of main vs check meter data per meter point <ul style="list-style-type: none"> % variance per meter point 	<ul style="list-style-type: none"> Weekly and monthly 	MDMS
6.12.13	POWI Report	Provide a comparison of meter official data and TEMSE data <ul style="list-style-type: none"> % variance per meter point 	<ul style="list-style-type: none"> Weekly and monthly 	MDMS and TEMSE
6.12.14	Data Management / Change data log	Audit trail of any activity of changes made to metering data	<ul style="list-style-type: none"> adhoc 	MDMS
6.12.15	Missing data report	Provide a view of how many days of data is missing per meter	<ul style="list-style-type: none"> Daily 	MDMS
6.12.16	Auto—plugged report	Provide a view of which metering points have been auto-plugged (according to Transmission rules) and the dates when they auto-plugged	<ul style="list-style-type: none"> Daily 	MDMS

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Number	Report Name	Functionality	Frequency	Data Source
6.12.17	KVA Report	Provides a report on the calculations of kVAh data per interval	• adhoc	MDMS
6.12.18	Power Factor Report	Provides a report on the power factor of the meter point or station	• adhoc	MDMS
6.12.19	Official / Totalized Profile Data	Provides the hourly or 30 min official negative, official positive or official totalised data per meter point	•	MDMS
6.12.20	Meter Profile Data	Provides a report of meter profile data for both main and check meters <ul style="list-style-type: none"> Main and check profile data can be sourced from processing data, staging data or changed data 	• adhoc	MDMS
6.12.21	Meter Status Report	Provides a view of which meters are commissioned and decommissioned	• adhoc	Interval Meter DAS / MDMS
6.12.22	Meter Alarm Report	Provides a view of which alarms were received from the meters which shall include but not limited to the following: <ul style="list-style-type: none"> Phase fail Power failure Clock adjustment Meter system failure (battery failure, profile memory access failure etc.) 	• adhoc	Interval Meter DAS
6.12.23	Energy reading during outage report	Provides a report on metering points with an open breaker status reading non-zero profile data.	• adhoc	EMS and MDMS
6.12.24	MDMS User list	Provides a list of users on the system indicating the active status and level of access	• adhoc	MDMS

6.13 User Interfaces

The MDMS shall provide for the following user interfaces in relation to the functionality described:

Number	Report Name	Type of User Interface	Functionality
6.13.1	Data processing	Web / GUI Interface	Process the meter readings into meter data store
6.13.2	Meter asset validation	Web / GUI Interface	Validates the meter asset against the Enterprise Asset Management System
6.13.3	Meter data management	Web / GUI Interface	Repository for interval and non-interval meter readings. Provides validation, editing and estimations and prepares meter readings for billing

Number	Report Name	Type of User Interface	Functionality
6.13.4	Audit and reporting	Web / GUI Interface	Provides the operational reporting and audit trails
6.13.5	Exception management	Web / GUI Interface	Functionality handles meter device, interface, reports exceptions and raises workflow items for action
6.13.6	Meter events management	Web / GUI Interface	Functionality within MDMS that handles all variants of events and alerts
6.13.7	Configuration management	Web / GUI Interface	Functionality within MDMS that looks after optimal functioning of all elements within the MDMS
6.13.8	Validation, Verification and acceptance of Estimations	Web / GUI Interface	Functionality to validate, edit and accept estimate missing reads
6.13.9	Meter reading profiling	Web / GUI Interface	Capability to provide customers load profiles. The presentment of the load profile can be through a portal.
6.13.10	MDMS Administration	Web / GUI Interface	Provides MDMS administration functionality to create users and profiles to administer the MDMS.

6.14 System Integration Requirements

The MDMS system integration requirements are depicted in the following diagram.

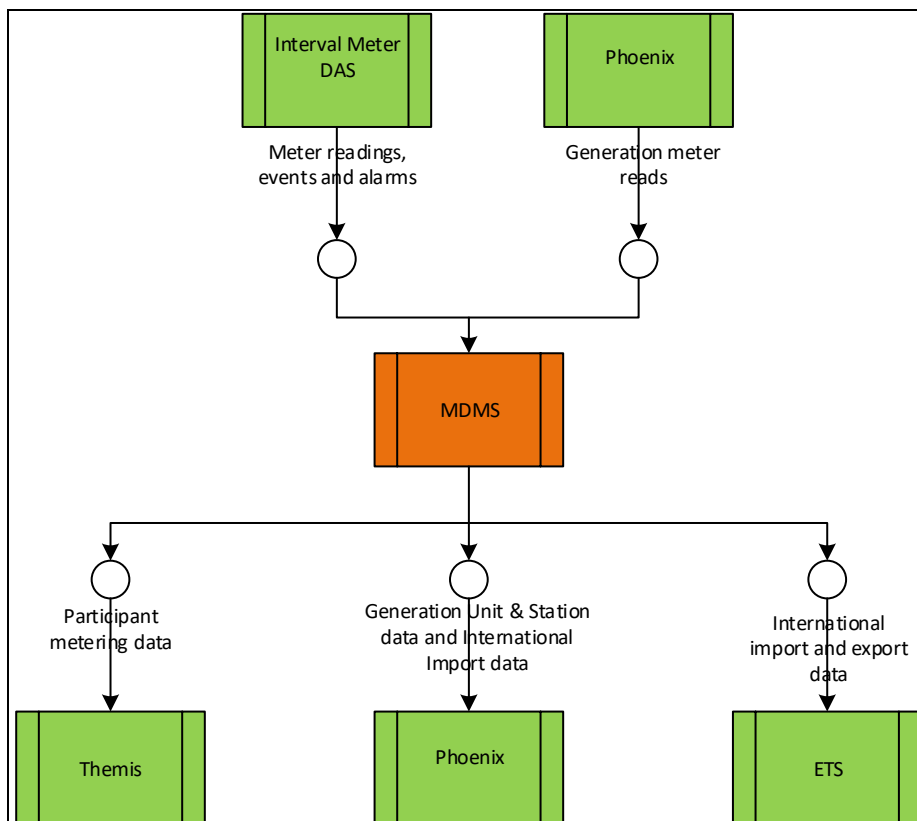


Figure 4: System Integration

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**INTERVAL METER DATA ACQUISITION SYSTEM AND
METER DATA MANAGEMENT SYSTEM – ENGINEERING
AND FUNCTIONAL REQUIREMENTS**
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Number	Functionality	Sending System	Receiving System	Information to be integrated
6.14.1	Interval metering and event data	Interval Meter DAS	MDMS	Meter readings, alarms and events of Transmission customers and substations
6.14.2	Participant metering data (PMR file)	MDMS	Themis	IPP data, Main Transmission (MTS) metering data and international export and import data
6.14.3	Generation metering data (GMR file)	MDMS	Phoenix	Individual unit and station values as well as international import data
6.14.4	Generation metering data (GMR file)	Phoenix	Themis	Official station sent-out values Remove the GMR data link between Phoenix and Themis and have it between Tx MDMS and Themis
6.14.5	Adhoc GMR file	Phoenix	MDMS	Metering values in case of data loss from Gen Tran meters
6.14.6	International import and export data	MDMS	ETS	International Energy export and import data

6.15 Data Retention and Archiving Requirements

- The information created and stored by Eskom's information systems shall be retained for a minimum period that meets both legal and business requirements, as prescribed in the formal procedure.
- Day-to-day electronic information retention shall ensure that past and current business information is readily available to authorised users and that archives are both created and accessible in case of need.
- The system shall have the capability to store all metering data (raw and official metering data) for a minimum period of 5 years.

7. Authorization

This document has been seen and accepted by:

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8. Revisions

Date	Rev.	Compiler	Remarks
Aug 2022	1	M Omar	Document required for RFP

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9. Development team

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

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10. Acknowledgements

Not applicable