Eskom	Standard	Technology

Title: **PARTICULAR REQUIREMENTS FOR ESKOM SMART METERING SYSTEM**

Unique Identifier:	**240-126910106**
Alternative Reference Number:	**<n/a>**
Area of Applicability:	**Engineering**
Documentation Type:	**Standard**
Revision:	**Draft 3.1**
Total Pages:	**12**
Next Review Date:	**May 2028**
Disclosure Classification:	**Controlled Disclosure**

Compiled by	Approved by	Authorized by
Edison Makwarela	**TBA**	**TBA**
Senior Consultant Engineering	**Middle Manager – Dx PTM&C**	**Senior Manager Engineering & Technology**
Date:	Date:	Date:

Supported by

TBA

Senior Manager Engineering & Technology

Date:

PCM Reference: **PTM & C**

SCOT Study Committee Number/Name: **Metering and Measurement SC**

Content

1. Introduction

Eskom has adopted NRS 049-2:2024 Edition 3 as for the specification of requirements for smart metering equipment. This standard specifies Eskom particular as extensions or exclusions of NRS 049-2:2024 Edition 3 requirements.

2. Supporting clauses

2.1 Scope

This document details the minimum functional requirements for smart metering systems and associated performance levels that will apply to metered electricity customer installations where a smart metering infrastructure roll out is considered.

In the context of this document smart metering system refers to a combination of the following components: Smart Meter, Network Gateway (NG)/Data Concentrator (DC)/Aggregator, Customer Interface Unit (CIU) and Head End System (HES). The detailed requirements for the HES (which form part of the smart metering system) are not covered in this document and are covered in a separate document. All HES implementations offered to Eskom shall comply with the “Group IT Business Requirement Specification (BRS) AMI head-end solutions (AMI Project) - GCS20” and a limited set of applicable requirements stated herein.

The requirements in this document apply to the smart metering system excluding requirements for the HES. These requirements are minimum requirements only and do not limit the implementation of a smart metering system that have functionality and performance that exceed the requirements of this document.

This document shall be applied in conjunction with the latest version of NRS 049-2:2024.

2.1.1 Purpose

The purpose of this document is to ensure that while NRS 049-2:2024 is the de facto standards for smart metering systems, Eskom specific requirements deviating from NRS 049-2:2024 are clearly stated to ensure seamless integration of the smart metering system with legacy Eskom systems. The document further seeks to ensure that the smart metering technology implemented by Eskom is future proofed.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

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] 240-61266818: Specification for GSM/GPRS Modems for Remote Metering

[2] Group IT Business Requirement Specification (BRS) AMI head-end solutions (AMI Project) - GCS20”.

[3] IEC 62055-41 Electricity metering - Payment systems - Part 41: Standard transfer specification (STS) - Application layer protocol for one-way token carrier systems

[4] NRS 049-2:2024 Edition 3 Advanced metering infrastructure requirement for smart metering system - Part 2: Requirements for smart metering equipment

[5] SANS 1524-1 Electricity payment systems - Part 1: Payment meters

[6] STS101-2 Standard Transfer Specification – Physical Layer Protocol for a two-way virtual token carrier for remote connection over DLMS/COSEM

[7] IDIS Interoperability specification – Package 2 – IP Profile Edition 2.0 (including G3-PLC), 03-09-2014

[8] IDIS Interoperability specification – Package 2 – Smart Metering Objects Edition 2.0 (including G3-PLC), 03-09-2014

2.2.2 Informative

[9] IEC 62051 Electricity metering - Glossary of terms

[10] ISO 9001 Quality Management Systems.

[11] SANS 1524-4 Electricity payment systems - Part 4: National prepayment electricity meter cards

[12] SANS 15417 Information technology: Automatic identification and data capture techniques - Code 128 bar code symbology specification

[13] ST 240-76619489 Eskom specification: Accelerated Environmental Stress Test for Solid State Electricity Metering Equipment

2.3 Definitions

2.3.1 General

Definition	Description
Customer interface Unit (CIU)	The portion of a meter that contains interfaces (input and/or output) to interact with the meter. The Customer interface Unit is sometimes included with the Measurement Unit to form a self-contained meter, but it may also exist as a separate Unit e.g., as in the implementation of a split meter.
Data Concentrator	Intelligent device in hierarchical communications network where incoming data (generated by multiple meters) is processed as appropriate and then repackaged, relayed, retransmitted, discarded, responded to, consolidated, prioritized and / or increased to multiple messages. The data concentrator acts as a DLMS/COSEM client and may hold DLMS security keys.
DLMS	Device Language Message specification" - a generalised concept for abstract modelling of communication entities
IDIS	IDIS is a publicly available technical interoperability specification based on open standards and supports the implementation in interoperable products. The specification is for smart metering companies who are committed to providing interoperable products based on open standards.
Smart metering equipment	Smart meters, customer interface units, data concentrators, network gateways and aggregators
Interoperability	Interoperability is the ability of a system to exchange data with other systems of different types and/or from different manufacturers.
Measurement Unit (MU or MCU)	Measurement Unit (or Measurement Control Unit) as defined in SANS 1524-1 with the additional meaning that the term Measurement Unit may also be used to describe a complete meter where the Measurement Unit and Customer interface Unit are contained inside a single device.
Network Gateway	Device that fully implements the ISO-OSI model for all layers and is used to convert data protocols between different communication systems and standards. In NRS 049-2:2024 this device contains additional functionality as outlined under clause 6.7 of that specification. **Note:** Gateways work on all seven layers of ISO-OSI architecture. The main job of a gateway is to convert protocols between communications networks.

Definition	Description
Power Limiting	An automatic load disconnection function provided in prepayment meters to limit the average power consumed, to the value programmed in the meter with the relevant STS management token. The average power consumed is calculated over a number of pulses and is therefore not suitable to serve as input for any protection feature.
Split Meter	Meter where the Measurement Unit and Customer interface Unit are contained in separate enclosures.
Modular on-board cellular network modem	Modular on-board modem is defined as a hot swappable modem that is mounted internally to the network gateway or meter. It obtains its power internally from the meter or the network gateway and its data communications are also routed internally.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
ACD	Appliance Control Device
BBPLC	Broadband Power Line Carrier
COSEM	Companion Specification for Energy Metering
DC	Data Concentrator
DLMS	Device Language Message Specification
DLMS UA	DLMS User Association
ERPS	Enterprise Resource Planning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HAS	Home Automation System
HES	Head-End System
HHU	Handheld Unit
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LNAP	Local Network Access Point
NG	Network Gateway
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
NRS	National Rationalised Specification
NTC	Numeric Token Carrier
PLC	Power Line Carrier

Abbreviation	Description
POS	Point Of Sale
RF	Radio Frequency
RFID	Radio Frequency Identification
SANS	South African National Standard
STS	Standard Transfer Specification
VS	Vending System
VTC	Virtual Token Carrier

2.5 Roles and responsibilities

Not Applicable

2.6 Process for monitoring

Not Applicable

2.7 Related/supporting documents

Not Applicable

3. General requirements for smart metering equipment

The requirements of NRS 049-2 clause 4 shall apply.

Where the requirements in this document deviate from the requirements in NRS 049-2:2024, the requirements in this document shall prevail.

Where a specific requirement in this document is not a minimum requirement but stipulated as a future requirement the supplier shall ensure that the hardware of supplied devices (meters and NG/DC) has the capability (e.g., sufficient memory and processing power) to host and process of future requirements without the need to upgrade the hardware of installed devices.

3.1 RFID tagging of meters and data concentrators

Meters and Data Concentrators shall be RFID tagged for the purposes of asset tracking.

The RFID shall be affixed to the Meters and Data Concentrator such it is not possible to remove the tag without leaving a physical mark on the meter or Data Concentrator.

The RFID tag shall be affixed to the Meters and Data Concentrator such that it possible to read the RFID tag with the applicable scanner when the meter installed without the need to first disconnect and remove the meter or Data Concentrator from the installation point.

The RFID tag number shall correspond or match the serial number of the meter or Data Concentrator.

It shall be possible to scan all meters packed in a box without unpacking such meters.

3.2 Construction requirements

The requirements of NRS 049-2 clause 4.3 shall apply.

Smart Meter, Network Gateway (NG)/Data Concentrator (DC)/Aggregator shall have modular telecommunication module that is removable to accommodate alternative and future telecommunication technologies. For example, the PLC communication module can be replaced by NBIoT module without replacing the actual meter.

4. Particular requirements for smart meters

4.1 General

The requirements of NRS 049-2:2024 clause 5 shall apply.

4.2 Communication interfaces

The requirements of NRS 049-2:2024 clause 5.7 shall apply together with clauses 5.2.1. to 5.2.x. detailed of this standard.

4.2.1 Reference architecture

To enable interoperability, the specification of communication protocols in this standard follows the principles defined in IDIS Package 2 clause 5 and the reference architecture given in Figure 1 of NRS 049-2:2024.

The interface naming convention shall be according to NRS 049-2:2024 Figure 1.

Table 2 below provides an interface mapping between NRS 049-2:2024 and IDIS Package 2.

Table 1: Interface mapping between NRS 049-2:2024 and IDIS Package 2

IDIS Package 2 interface name	NRS 049-2 Figure 1 equivalent interface name	Description
I3	G	Interface between data HES and smart meter / bulk meter. This interface shall be referred to as G1 in this standard.
I3.2	G	Interface between HES and data concentrator. This interface shall be referred to as G2 in this standard.
I_{Con}	C	Interface between hand-held unit and data concentrator / network gateway. This interface shall be referred to as CHHU in this standard.
I3.1	C	Interface between data concentrator / network gateway and smart meter.
I1	M	Interface between smart meter and customer interface unit.
I_{E-M}	M	Interface between hand-held unit and smart meter. This interface shall be referred to MHHU as in this standard.

4.2.2 Standard interfaces

4.2.2.1 Interface G1

This interface shall support 4G/LTE or NB-IoT as specified in clause 5.2 of IDIS Package 2.

In addition to COSEM objects specified in Table 10 of IDIS Package 2, the 4G/LTE and NB-IoT modular on-board cellular modem shall be configurable via the smart meter's standard interfaces using the following COSEM objects specified in IEC 62056-6-2:

- "GSM diagnostic" (class_id = 47, version 2)
- "LTE monitoring" (class_id = 151, version 1)

A *C* interface is not mandatory for meters with a G1 interface (i.e., point-to-point meters).

4.2.2.2 Interface G2

This interface shall support 4G/LTE or NB-IoT as specified in clause 5.2 of IDIS Package 2.

The IEC 62056-9-1 web service shall be implemented in data concentrators / network gateways to enable interoperable data exchange over the G2 interface or the data concentrator / network gateway shall implement gateway functionality only as defined in IEC 62056-8-5 clause 4.

4.2.2.3 Interface C

This interface shall support G3-PLC as specified in IEC 62056-8-5 or BB-PLC as specified in the Q/GDW 11612 set of standards.

Where BB-PLC is used in the *C* interface, the application layer implementation shall be DLMS/COSEM as specified in IEC 62056-5-3 and shall support, as a minimum, the use cases, functionality and object model specified in this standard.

A *G1* interface is not mandatory for meters with a *C* interface.

4.2.2.4 Interface M

The communication protocol choice for this interface is left to the smart meter manufacturer.

4.2.2.5 Interface M_{HHU}

This interface shall support direct local data exchange according to IEC 62056-7-6. The physical layer of this interface shall be an optical interface according to IEC 62056-21.

4.2.3 Security requirements

Security Suite 1 of IEC 62056-5-3 is preferred; however, Security Suite 0 shall also be accepted on condition that it shall be possible to upgrade to Security Suite 1 through a remote firmware upgrade without a need to upgrade the hardware of the smart meters.

4.3 Functional requirements

4.3.1 Use cases

The requirements of NRS 049-2:2024 Annex A shall apply except subclause A.7.

Furthermore, the following augmentations and/or deviations to clause Annex A of NRS 049-2:2024 shall apply:

a) The requirements of NRS 049-2:2024 Annex A shall apply to both currency and kWh credit when the meter is operating in prepayment mode.

b) In addition to the requirements of NRS 049-2:2024 Annex A, the default integration period shall be 30 minutes. Six (6) channels of load profiling memory shall be provided for: kWh import, kWh export, kVArh Q1, kVArh Q2, kVArh Q3 and kVArh Q4.

c) The requirements of NRS 049-2:2024 clause A.9.3 are optional where implemented in the smart meter, it shall be possible for the utility to enable/disable such functionality.

d) The requirements of NRS 049-2:2024 clause A.13.11, The HES downloads a new firmware image to the CIU. Restart of the new firmware shall be scheduled to automatically occur on a future date and time.

e) With reference to clause A.10.1 of NRS 049-2:2024, capability to measure voltage harmonics is not required.

f) With reference to clause A.12.1 of NRS 049-2:2024, item (oo), is not required. It shall be possible to switch a meter mode between prepaid and post-paid using DLMS/COSEM objects only without having to visit the meter (remotely).

g) DLMS/COSEM objects only shall be used to configure the power limit of a meter.

4.3.2 Meter COSEM interface objects

The smart meter shall comply with at least with the IDIS Package 2 specification and object model including extension D objects and functionality.

Furthermore, the following requirements shall apply:

- The Consumer Information Push option (clause 6.11 of IDIS Package 2) shall not be implemented instead CIU functionality and communication interface described in this document shall be implemented.
- The minimum payment metering objects listed in the table below shall be implemented in the smart meter and supported by the CIU and DC/NG.

Table 2: Payment metering objects

Instance Name	OBIS	IC
Account	0-0:19.0.0.255	111
Account passive	0-1:19.0.0.255	111
Standing charge	0-0:19.20.1.255	113
Standing charge passive	0-1:19.20.1.255	113
Consumption charge – Energy import	0-0:19.20.0.255	113
Consumption charge – Energy export	0-0:19.20.2.255	113
Token credit	0-0:19.10.0.255	112
Emergency credit active	0-0:19.10.1.255	112
Emergency credit passive	0-1:19.10.1.255	112
STS token gateway	0-0:19.40.0.255	115
Max vend limit	0-0:19.50.2.255	1

Max credit limit	0-0:19.50.1.255	1
Charge collection history	0-0:99.14.0.255	7
Token credit history	0-0:99.15.0.255	7
Token transfer log	0-0:99.17.0.255	7
IEC 62055-41 attributes	0-0:19.60.0.255	116

- The *STS Token Gateway* as specified in STS 101-2.
- The prepayment functionality shall be implemented according to IEC 62055-41 (STS).

4.3.3 Handheld Unit for local interrogation of meter

When the meter is built and supplied without local display, the supplier shall provide Eskom with local interface devices that will be used by Eskom to communicate and interrogated the meters locally through an external port (e.g., optical port).

4.4 Meter configuration software.

The requirements of NRS 049-2:2024 clause 4.6. shall apply.

5. Particular requirements for customer interface units

The requirements of NRS 049-2:2024 clause 7 shall apply.

6. Particular requirements for data concentrators / network gateways / aggregators

The requirements of NRS 049-2:2024 clause 8 shall apply.

6.1 Functional requirements

The Network Gateway/Data Concentrator/Aggregator shall preferably have additional ports where at least the following transformer data can be collected:

- Temperature
- Smoke detection
- Humidity
- Power quality
- Partial discharge
- Total energy dispensed by the transformer.

The preference is for the Network Gateway/Data Concentrator/Aggregator to have a built-in measuring capability.

Where the Network Gateway/Data Concentrator/Aggregator has an embedded measuring capability, the metering potion of the Network Gateway/Data Concentrator/Aggregator shall meet the metering requirements stipulated in section 5 of NRS049-2:2024 with the exception of clauses:.

Where the Network Gateway/Data Concentrator/Aggregator does not have a built-in measuring capability, it shall be supplied with an external bulk meter for measuring total energy delivered to all smart meters under the device. The bulk meter shall comply with section 6 of NRS-2:2024.

The communication module of the Network Gateway/Data Concentrator/Aggregator shall be modular and removable. The communication module of the Network Gateway/Data Concentrator/Aggregator shall be modular and removable.

7. Particular requirements for cellular modems

The requirements of NRS 049-2:2024 clause 9 shall apply.

8. Authorization

This document has been seen and accepted by:

Name and surname	Designation
A Mashao	Senior Manager: PTM&C
Sikelela Mkhabela	Senior Manager Maintenance and Operations

9. Revisions

Date	Rev	Compiler	Remarks
January 2025	3	ME Makwarela	Updated the document to Include BBPLC communication technology, modular communication module, RFID tags on meters and to align with NRS 049-2:2024 Edition 3
Sept 2022	2	ME Makwarela	Document revised to aligned with requirements of the NRS049:2016 Edition 2.1. The following changes were made in NRS049: • Removed requirements for "route-over" routing and RPL protocol as exclusive routing protocol. • Replaced IEEE 1901.2 and IEEE 18.15.4g with G3-PLC and Wi-SUN FAN, respectively. • Update normative references and certification requirements. • Simplify security requirements. • Removed references to a future national companion specification • Removed ACD and kiosk controller from metering document
March 2018	1	ME Makwarela	Document revised to include requirements for the Head end System and modems

10. Development team

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

- Deon Van Rooi
- Edison Makwarela
- Henri Groenewald
- Reginald Brooks
- Shawn Papi

11. Acknowledgements

Not Applicable