



Eskom

Report

Technology

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1. Introduction

This document provides an overview of Eskom’s technical evaluation criteria for the Request for Proposal (RFP) or Request for Qualification (RFQ) for Data Concentrators and single & three phase smart meters with associated customer interface units (CIUs) and embedded cellular modems. It is supplementary to the Eskom standard for smart metering systems, i.e., *Eskom 240-126910106 Particular requirements for Eskom smart metering system*.

An Excel sheet title “Technical Schedule for Smart Meters” is provided with this document for the purpose of capturing product data required to fulfil requirements of this technical criteria and for conducting technical evaluations described herein. This Excel sheet is referred to as the *Technical Schedule* in the rest of this document.

2. Supporting clauses

2.1 Scope

The technical evaluation criteria detailed in this document is for an RFP/RFQ for the manufacturing, supply, evaluation, testing and acceptance of smart metering devices for the purpose of RFP/RFQ and for listing manufactures on the Technically Evaluated and Accepted Products (TEAP) database as per Eskom 240-170001064

The RFP is for the manufacturing, supply, technical evaluation, testing, and acceptance of the following smart metering systems components:

Table 1: List of items for enquiry

	Items
1.	Single Phase DIN Rail G3-PLC Split Smart Meter with CIU
2.	Single Phase BS Split G3-PLC Smart Meter with CIU
3.	Single Phase BS Split Smart Meter with CIU + Internal/Plug-in GSM Modem
4.	Three Phase BS G3-PLC Split Smart Meter with CIU
5.	Three Phase BS Split Smart Meter with CIU + Internal/Plug-in GSM Modem
6.	Gateway/Data Concentrators (DCU) G3-PLC + Internal/Plug-in GSM Modem

Smart meter manufacturers and/or suppliers shall respond to the RFP/RFQ by providing information and samples for all the items numbered 1 to 5 in Table 1 above. Information and samples for Item 6 shall be provided with every response offering Items 1, 2 and/or 4. Furthermore, the submitted Item 6 samples shall be compatible with the offered Items 1, 2 and/or 4 test samples. Where item 6 is offered as a standalone item, the supplier shall ensure that the item 6 is compatible with meters from different suppliers that Eskom is using within a month.

2.2 Normative references

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

- [1] Eskom 240-126910106, *Particular requirements for smart metering system*
- [2] Eskom 240-170001064, *Governance Rules and Processes for Managing the Technically Evaluated and Accepted Products (TEAP) Database in Eskom Distribution*
- [3] DLMS UA 1000-1 Ed 15 Part 2:2021, *COSEM Interface Classes*, Blue Book Part 2
- [4] IDIS Interoperability Specification, *Package 2 IP Profile*, Edition 2.0 (including G3-PLC), 2014
- [5] IDIS Interoperability Specification, *Package 2 IP Smart Metering Objects*, Edition 2.0 (including G3-PLC), 2014

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- [6] ITU-T G.9903 (2017) Amd.2 (03/2023), Series G: Transmission systems and media, digital systems and networks Access networks – In premises networks, Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks.

2.3 Informative references

- [1] Great Britain Companion Specification (GBCS) v0.8.1: complete Word version with embedded HTML and Excel files [Access: https://assets.publishing.service.gov.uk/media/5a7e41a840f0b6230268a2d4/GBCS_v0.8.1.docx].
- [2] DNV DLMS Test Suite [Access: [DLMS test suite for smart meters DNV](#)]

3. Technical Returnables for RFP

Suppliers shall provide the following information:

- 1) All submissions and/or documents required for compliance with mandatory requirements outlined in section 4.1 of this document.
- 2) Excel files (mandatory requirements and functional evaluation sheet) shall be completed and returned to Eskom in Excel format (electronic) and in Acrobat PDF format for auditing purposes (named “Technical Schedule for Smart Meters”)
- 3) Details regarding the make, model number and firmware version of all items offered shall be fully completed in the Excel file named “Technical Schedule for Smart Meters”.
- 4) Data sheets, brochures and detailed product manuals for all offered devices.
- 5) Suppliers shall provide **2 sample meters** (per item as listed in Table 1 above) of products to be evaluated and tested when submitting RFP/RFQ documents.
- 6) All submitted test samples shall be configured with the following LLS password (Table 2 below).

Table 2: DLMS configuration

Security parameter	Value	DLMS Client
LLS password	12345678	1 (Management)

- 7) The STS application layer implemented for all submitted test samples shall be configured as stated below to enable the use of test tokens:
 - A MeterInterface connected to a meter loaded with the DITK 1 as specified in Table1 below. The meter’s entire TID stack shall, with the exception of the tokens used to fill up the meter with credit, be preloaded with the TID 5A45A1₁₆; this TID corresponds to the token issue date and time of **2025-04-01 09:05**.
 - If the payment meter stores its manufacturing date in non-volatile RAM and uses this to determine the validity of a token, then the meters submitted must have this date set to **1st January 2014 00h00**.
 - The meters to be supplied are listed in Table 3 below.

Table 3: STS parameters

DUK1	ABABABABABABABAB
Algorithm Type	EA07

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Tariff Index (TI)	01
Key Revision no.	1
Meter no.	Defined by smart meter manufacturer.
Current Limit	20 A or 60 A (for single phase meters) 80 A (for polyphase meters)

- 8) All samples NOT configured according to Table 2 and 3 above shall be disqualified from further testing.

4. Technical Evaluation and Testing of Meters and Data Concentrators

The Technical Evaluation is comprised of the following two phases:

- Phase I: Mandatory Requirements (Desktop evaluation)
- Phase II: Functional Evaluation (Laboratory testing)

The evaluation process to be followed is given below, a) to g), and illustrated in the flowchart diagram given in Annex A.

- Eskom compiles technical requirements and RFP/RFQ document and proceed to issue RFP/RFQ to the market.
- On the prescribed closing date, Eskom will receive bids and test samples from suppliers responding to the RFP/RFQ.
- After receiving the bids, the mandatory requirements phase of the evaluation process will be conducted. This is to ensure that suppliers meet basic requirements in preparation for the functional evaluation phase using the DLMS Test Suite software.
- Where a product does not meet mandatory requirements, the product will not be evaluated further. The feedback report for such a product will be compiled accordingly.
- Submissions that fully comply with the requirements (Phase I) will be subjected to the functional evaluation (Phase II) using the DLMS Test Suite software.
- If the product meets the functional evaluation threshold, the product will be recommended for contract award subject to the supplier meeting the commercial evaluation threshold on condition that all applicable certificates and type test reports listed in Table 4 are submitted.
- Furthermore, if the product meets the functional evaluation threshold, the product will be listed on the TEAP Database on condition that all applicable certificates and type test reports listed in Table 4 are submitted.

Table 4: Certificates and type test reports required for contract award and TEAP listing.

DLMS UA certificate (for Eskom approved firmware version)
G3-PLC certificate (for meters with G3-PLC only)
STS certificate for currency and energy (for Eskom approved firmware version)
IDIS 2 certificate or object model listing (for Eskom approved firmware version)
Type test reports (SANS/IEC62055-31 or SANS1524-1 and SANS/IEC 62053-23 or SANS/IEC62053-24)
ICASA Radio Equipment Type Approval Certificate (for Cellular Network modem)

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h) While the product that have gone through this process should seamlessly integrate with existing HES's, contracted suppliers will be allowed a further 3 months to integrate their meters with exiting HES's.

4.1 Phase I: Mandatory Requirements

Each tender shall pass all Mandatory Requirements of technical evaluation. Tenderers not meeting any of the Mandatory Requirements shall be excluded from further evaluation.

Table 5: Mandatory Requirements

Mandatory Requirements		Evidence required
1.	<i>Technical Schedule</i> (mandatory requirements and functional evaluation sheet) are completed	Completed <i>Technical Schedule</i> submitted
2.	2 (two) Samples of each tendered product submitted	Samples submitted
3.	All meters shall be of the split meter design as defined in Eskom standard 240-126910106 clause 2.3.1	This will be determined from the submitted samples.
4.	Meters shall be capable of bi-directional energy metering and be able to measure and record active energy (import and export) and reactive energy (Q1, Q2, Q3 & Q4). Accuracy for active energy shall be class 1 according to SANS/IEC 62055-31 or SANS 1524-1 and accuracy for reactive energy shall be class 2 according to SANS/IEC 62053-23 or SANS/IEC 62053-24. Meter shall have markings and test outputs required for active and reactive energy measured as defined and referenced in SANS/IEC 62055-31 or SANS 1524-1 and SANS/IEC 62053-23 or SANS/IEC 62053-24.	This will be determined from the submitted samples.
5.	Commitment and declaration to fully integrate field devices (smart meters and DCUs) with Eskom approved HES's within 3 months of contract award.	Declaration in signed company letterhead.
6.	The dimension of the meters shall be according to 8.2 of NRS049 (BS Single phase & Three Phase) and Annex C of NRS049 for Single Phase DIN-Rail meters on enquiry submission date or development phase submission date if supplier is under development	This will be determined from the submitted samples.
7.	Meter terminal connections shall be according to NRS049 on enquiry submission date or development phase submission date if supplier is under development	This will be determined from the submitted samples.
8.	All submitted test samples shall be with the LLS password stipulated in Section 3 (6)	Supplier to confirm and submitted samples will be verified
9.	HDLC optical port is used for PHASE II testing. This port is mandatory for all smart meter samples, IEC 1107 (Mode E) shall not be accepted for PHASE II testing	Supplier to confirm that the HDLC optical port is implemented
10.	Where a data concentrator/gateway sample is submitted, the following information shall be declared: <ul style="list-style-type: none"> • 3-PLC PSK authentication / encryption keys • G3-PLC MAC address (could be IP address for • G3-PLC frequency) • Data concentrator/gateway web interface log in credentials (at least with administrator account) 	Data concentrator/gateway and meter sample(s) G3-PLC information provided in <i>Technical Schedule</i> .

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The Mandatory Requirements above are included in the *Technical Schedule for Smart Meters* Excel document as a separate Tab/Sheet and shall be completed in full by all tenderers.

Note 1: One sample per product tendered for is acceptable. However, the recommendation is for two samples to be submitted so that if the first sample fails to power up, the second sample will be used.

4.2 Phase II: Functional Evaluation

The minimum qualification threshold for Phase II evaluations shall be **85 %**.

The scoring of different use cases under the functional evaluation phase shall be as follows:

Table 6: Scoring of items in Functional Evaluation Sheet

Criteria	Score
Fully compliant (Indicated as Y in A&B Schedules)	3
Partially compliant - minor deviation (Indicated as P in A&B Schedules)	1
Non-compliant - major deviation (Indicated as N in A&B Schedules)	0

4.2.1 Testing approach

Each smart meter sample's communication interface is connected to a common DLMS Client (i.e., a software application that simulates a Head End System or Central Acquisition System or Data Concentrator).

The simulated system then generates a sequence of DLMS messages that invoke the smart meter's functionality that supports Eskom test cases specified in Table 5 below.

This enables the evaluation team to determine the smart meter's compliance to the Eskom's smart meter specification at use case level and, at communication protocol level.

The DNV GV Test Facility is used as the common DLMS Client (or simulated Head End System), informative reference [1].

Primarily, the HDLC optical port is used for PHASE II testing. This port is mandatory for all smart meter samples, IEC 1107 (Mode E) will not be accepted for PHASE II testing.

The Management Client association is used over the HDLC optical port to ensure access to the entirety of the object model implemented in the smart meter under test.

For test case number TC01, a G3-PLC sniffer is used to monitor and capture G3-PLC traffic between the smart meter under test and its data concentrator. The evaluation team uses the captured G3-PLC traffic to determine compliance with security requirements defined in the G3-PLC specification.

During the development phase, the supplier will be required to demonstrated functionality of the use cases in Table 7 using his own HES before the resubmitting the products for final testing with the DMLS test suit. This test, specified in 4 (g)above shall be conducted by the supplier with the Eskom team witnessing the test.

The tests defined for PHASE II shall be conducted by the Eskom technical team and not the tenderers.

Table 7: DLMS Test Cases for functional evaluation.

Test Case No.	Test case name	Description	References
TC01	Meter registration	<p>Test that meter implements all COSEM objects and functionality that supports automatic meter registration.</p> <p>Check that <i>System Title</i> and <i>COSEM Logical Device Name</i> formats are according to IDIS 2.</p> <p>Check that DLMS security is implemented in meter firmware is at least <i>Suite 0</i>.</p> <p>For Items 1, 2 and/or 4 only - Check that smart meter and Data Concentrator comply with G3-PLC specification join process.</p>	<ul style="list-style-type: none"> Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC02	Remote tariff programming	<p>Load Eskom approved tariff (e.g., Homeflex) into meter and set energy rate (Rand/kWh) in prepayment charge tables according to tariff.</p>	<ul style="list-style-type: none"> Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC03	Meter reading (On demand)	<p>Read import and export total energy registers and rate registers.</p> <p>NOTE 1: At its discretion, the Eskom technical team may inject import and export energy into smart meter to verify four quadrant measurement capability.</p> <p>Read available credit.</p> <p>Read STS data elements (i.e., DRN, TI, KRN, KT and SGC) from IEC 62055-41 attributes IC.</p> <p>Read Load Profile 1 and Load Profile 2, default profile entries, capture objects and capture period.</p> <p>Set LP1 and LP2 integration period to 5, 10-, 15-, 30- and 60-minutes capture period.</p>	<p>Eskom 240-126910106 clause 3.3.2 and 3.3.3</p> <p>DLMS UA 1000-1 Part 2 clause 4.6.6</p>
TC4	Meter reading (For billing)	<p>Read Billing Profile, default profile entries, capture objects and capture period.</p>	<p>Eskom 240-126910106 clause 3.3.2 and 3.3.3</p>
TC5	Disconnection and reconnection	<p>Disconnect meter and re-connect it.</p> <p>NOTE 2: Disconnect Arbitrator or IDIS 2 disconnecter objects may be implemented.</p>	<p>Eskom 240-126910106 clause 3.3.2 and 3.3.3</p>

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Test Case No.	Test case name	Description	References
		Set smart meter power limit and verify that it disconnects when limit is exceeded.	
TC6	Clock synchronisation	Synchronize meter's clock to a preselected date and time.	Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC7	Quality of supply reporting	Test that meter implements all objects and functionality that supports quality of supply reporting.	Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC9	Firmware update	Test that meter implements all objects and functionality that supports firmware upgrade.	Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC10	Meter supervision	Test that meter implements all objects and functionality that supports event / alarm detection and reporting.	Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC11	Consumer information	Check that CIU provides relevant information during all test cases.	Eskom 240-126910106 clause 3.3.2 and 3.3.3
TC21	Prepayment	Change meter to post-payment (credit) mode. Change meter to prepayment mode (monetary currency and energy). Insert STS credit token via communication interface (monetary and energy credit). Set period and amount for standing charge collection.	Eskom 240-126910106 clause 3.3.2 and 3.3.3 Annex B and C herein
TC100	Object list	Read meter's object list using <i>Management Client</i> and check that all objects specified in Eskom 240-126910106 clause are implemented in the meter firmware.	Eskom 240-126910106 clause 3.3.3
TC200	Data concentrator administration	Log into data concentrator web interface using admin password via local interface (e.g., LAN port). View list of meters connected to data concentrator.	

5. Accelerated Environmental Stress Testing

Eskom may choose to subject approved/accepted meter types and DCUs with associated modems which have passed the evaluation, to Accelerated Environmental Stress Testing (AEST). If Eskom decides to conduct AEST on such products, Eskom will contact successful supplier(s) to arrange for the supply of thirty (30) encoded meters and six (6) data concentrators within four weeks. The AEST consists of a variety of tests to simulate the life of the equipment under test in an accelerated fashion. The AEST tests are conducted by Eskom technical staff, covering the tests indicated below which are described in detail in the Procedure for Accelerated Environmental Stress Testing of solid-state metering equipment.

- Vibration and drop tests

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- Temperature and humidity cycling
- Supply voltage / load current profile
- Voltage interruptions
- Voltage dips
- Fast transient bursts
- Electrostatic discharges
- Lightning impulses

Meters and DCUs with its associated modems that are subjected to the above tests are required to pass the above tests without compromising any of its functionality. If any serious failures or deficiencies are detected in the accelerated environmental stress testing, the supplier shall, at his cost, address the deficiency to Eskom's satisfaction and replace the equipment that may have been installed already.

6. Proposal for independent test body for Broadband PLC

Eskom specification 240-126910106 for smart meters indicates the intention to migrate to Broadband PLC (BB-PLC) technology and to replace data concentrators with Energy Concentrator Units (ECUs) or Aggregators. While this remains the intention for the broader rollout of smart meters, the absence of an established independent testing and certification body (similar to the G3-PLC Alliance) currently hampers the implementation of BB-PLC devices, as such certification is necessary to avoid vendor lock-in.

In view of the above, Eskom requests bidders to submit proposals for the establishment of an independent testing and certification body for Broadband PLC. In addition, bidders are requested to submit a proposal for an open communication protocol stack between BB-PLC meters and the Energy Concentrator Units (ECUs) or Aggregators. This proposal shall be submitted as a separate file along with the bid.

7. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Thomas Jacobs	PTM&C Senior Manager (Acting)
Deon van Rooi	Metering, DC and Security Technologies Manager
Musa Mabila	Senior Manager – Limplanga Cluster
Sylvester Barei	Senior Manager – Gauteng Cluster

8. Revisions

Date	Rev	Compiler	Remarks
February 2025	6	ME Makwarela	Document revised to include new test key for STS base on 2014 Base date; relaxed mandatory requirements based on the learnings from the previous RFQ/RFP
March 2023	5	ME Makwarela	Document revised to include comments from Gauteng Cluster to strengthen supplier development.
February 2023	4	ME Makwarela	Document revised to include TEAP listing of products
September 2022	3	ME Makwarela	Remove development phase and HES evaluation from the document since HES is already in place
September 2017	2	ME Makwarela	<ul style="list-style-type: none"> Revise document to align with the requirements of NRS049 Included a section for the HES and development phase for 1 year
June 2015	1	J O'Kennedy	New document required for the issue of enquiry

9. Development team

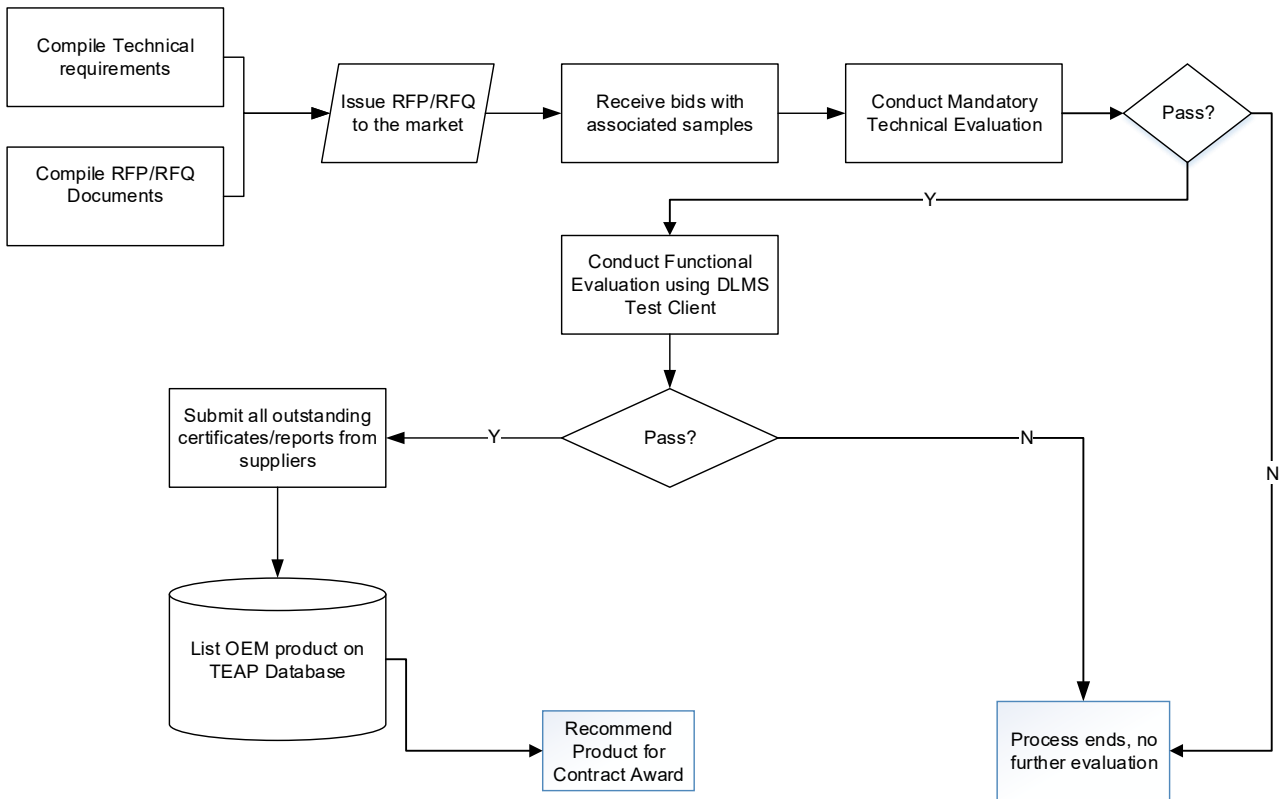
The following people were involved in the development of this document:

- Edison Makwarela
- Leri Matsoha
- Reginald Brooks
- Shawn Papi
- Nokwanda Shoji
- Kgomtso JamJam

10. Acknowledgements

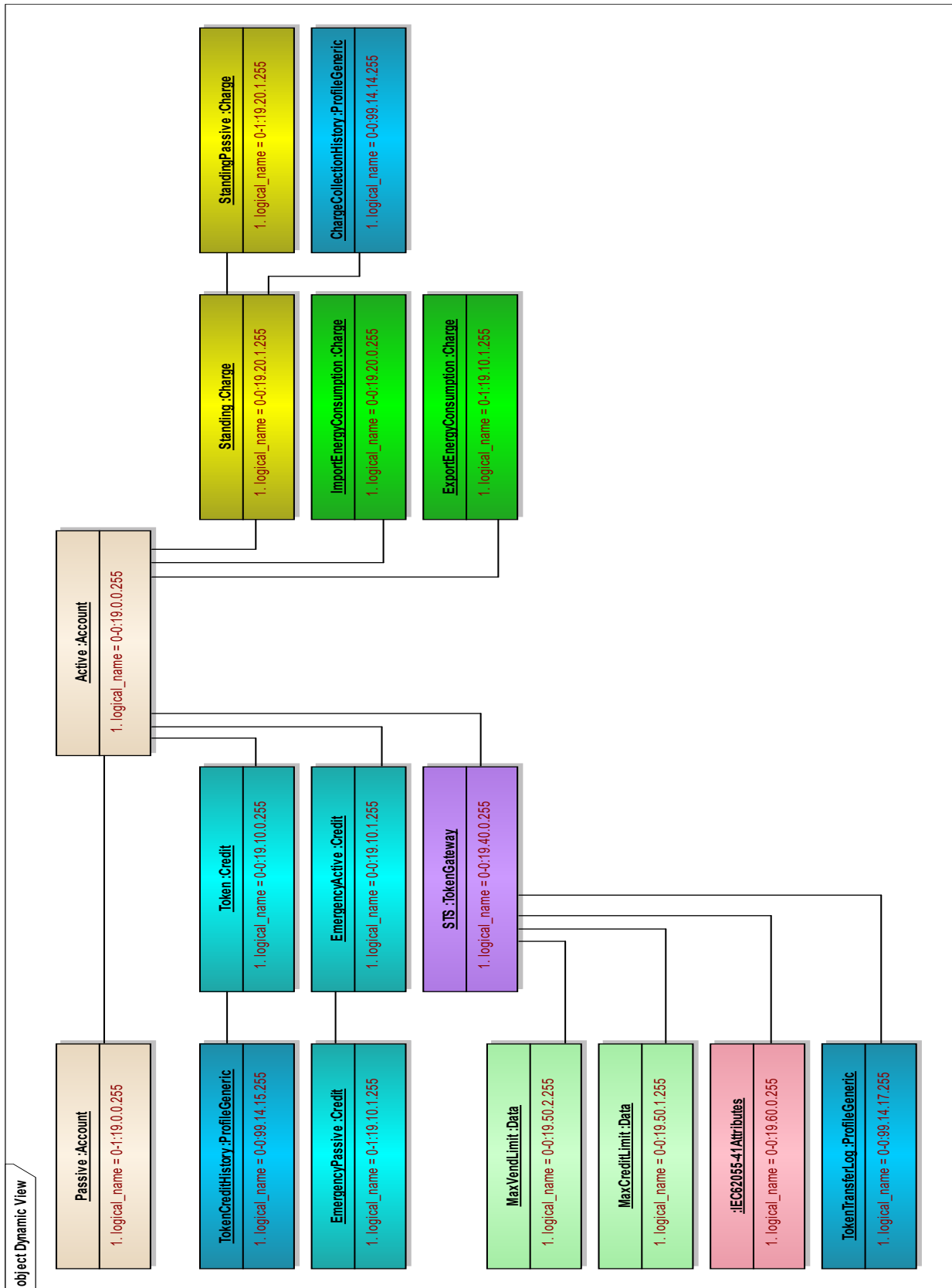
Not applicable.

Annex A – Technical evaluation process



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Annex B – Payment metering object model (Eskom 240-126910106)

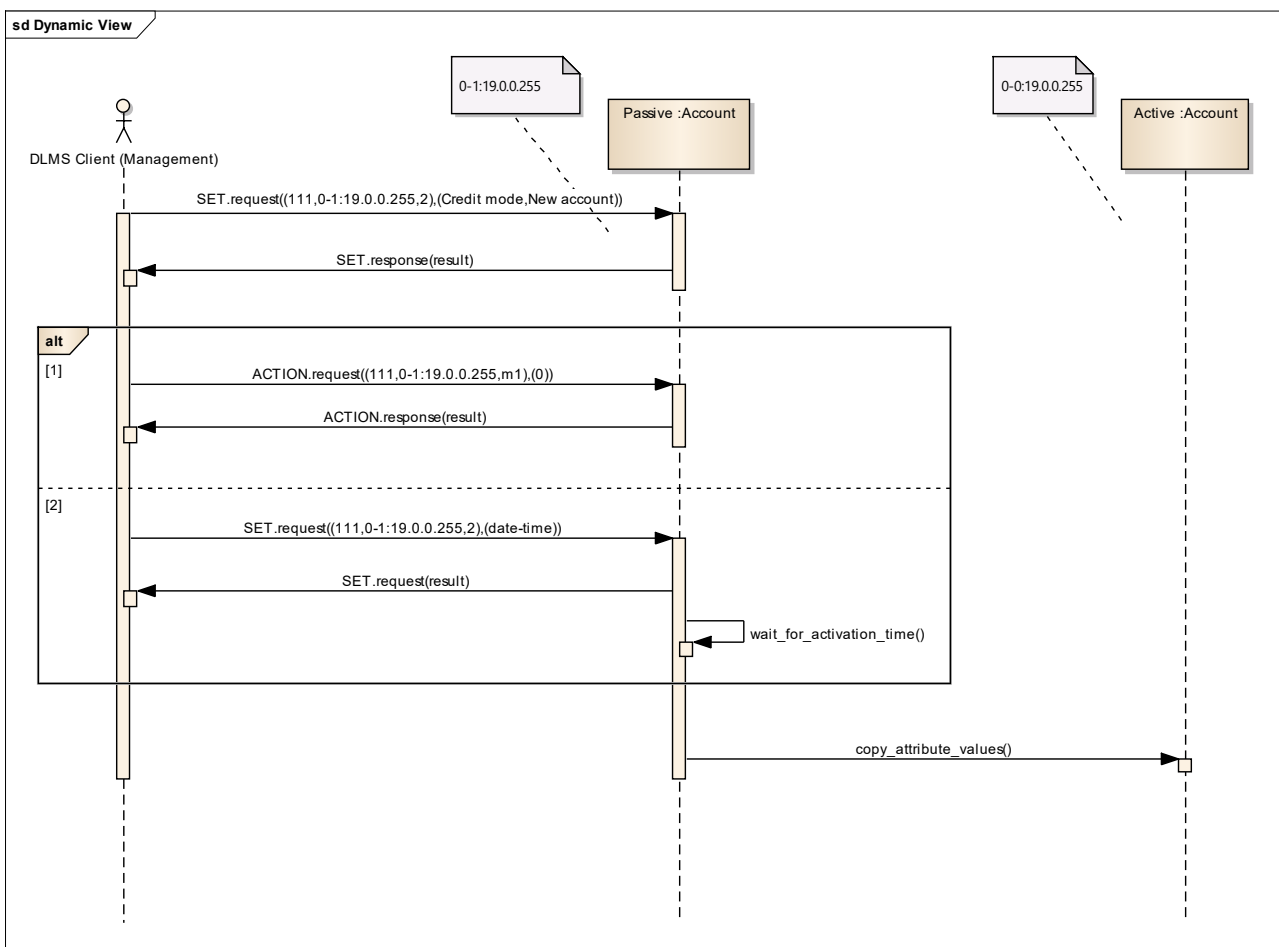


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Annex C – Payment mode change

When either (1) a DLMS command successfully sets the 'passive' Account object's account_activation_time (attribute ID 13, OBIS code 0-1:19.0.0.255) to 0x00000000000000000800FF or (2) the ESME's clock reaches the value in that attribute or (3) the activate_account method is invoked, the smart meter shall not activate *Account passive* object, as detailed in the Blue Book, but shall set the attributes in the *Account* object (OBIS code 0-0:19.0.0.255) as follows:

- set the payment_mode part of the account_mode_and_status attribute (attribute ID 2) to the payment_mode value in the *Account passive* object; and
- set each of the other static attributes (as defined in the Blue Book) to the corresponding value in the *Account passive* object.



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