



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:

**1**

Total Pages:

**25**

Next Review Date:

**April 2023**

Disclosure Classification:

**Controlled  
Disclosure**

Compiled by

**Edison Makwarela**

**Senior Consultant**

Approved by

**Deon Van Rooi**

**Metering, DC & Security  
Technology & Support  
Manager (Acting)**

Authorized by

**Richard McCurrach**

**Senior Manager – PTM & C**

Date: **04-04-2018**

Date: **04-04-2018**

Date: **4/4/2018**

**Supported by SCOT/SC**

**Mohamed Omar**

**Metering & Measurements  
Study Committee**

Date: **05/04/2018**

PCM Reference: **PTM & C**

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

## Content

### Page

1.	Introduction .....	5
2.	Supporting clauses .....	5
2.1	Scope .....	5
2.1.1	Purpose .....	5
2.1.2	Applicability .....	5
2.2	Normative/informative references .....	5
2.2.1	Normative .....	5
2.2.2	Informative .....	6
2.3	Definitions .....	7
2.3.1	General .....	7
2.3.2	Disclosure classification .....	8
2.4	Abbreviations .....	8
2.5	Roles and responsibilities .....	9
2.6	Process for monitoring .....	9
2.7	Related/supporting documents .....	9
3.	Requirements for smart metering system .....	9
3.1	Communication requirements .....	10
3.1.1	Network reference architecture .....	10
3.1.2	Network routing .....	10
3.1.3	Network topologies .....	11
3.1.4	Standard interface .....	11
3.1.5	Interface certification .....	12
3.2	Security requirements .....	12
3.2.1	General requirements .....	12
3.2.2	Device security requirements .....	12
3.2.3	Initial key management for server .....	12
3.2.4	Initial key management for HHU .....	13
3.2.5	Initial key management for CIU .....	13
3.2.6	Client/server key agreement .....	13
3.3	Functional requirements .....	13
3.3.1	Performance and availability requirements .....	13
3.3.2	Use cases .....	13
3.3.3	Meter COSEM interface objects .....	13
3.3.4	Appliance control device COSEM interface objects .....	14
3.3.5	Kiosk controller COSEM interface objects .....	14
3.3.6	Mobile phone/CIU application layer functions .....	14
3.3.7	Network gateway application layer functions .....	14
3.3.8	Functional certification .....	14
3.4	General requirements for meter, CIU, NG and ACD devices .....	14
3.4.1	General requirements for meter, CIU, NG and ACD devices .....	14
3.4.2	Mechanical requirements for meter, CIU, NG and ACD devices .....	14
3.4.3	Climatic requirements for meter, CIU, NG and ACD devices .....	14
3.4.4	Electrical requirements for meter, CIU, NG and ACD devices .....	14
3.5	Particular requirements for meters .....	14
3.5.1	General requirements for meters .....	14

**ESKOM COPYRIGHT PROTECTED**

3.5.2	Mechanical requirements for meters .....	14
3.5.3	Climatic requirements for meters .....	14
3.5.4	Electrical requirements for meters .....	14
3.5.5	Metering accuracy requirements.....	15
3.5.6	Time keeping requirements for meters .....	15
3.5.7	Handheld Unit for local interrogation of meter .....	15
3.5.8	Software .....	15
3.6	Particular requirements for customer interface units .....	16
3.6.1	General requirements for customer interface units.....	16
3.6.2	Mechanical requirements for customer interface units .....	16
3.6.3	Electrical requirements for customer interface units.....	16
3.7	Particular requirements for network gateways .....	16
3.7.1	General .....	16
3.7.2	Mechanical requirements.....	16
3.7.3	Electrical requirements .....	16
3.8	Particular requirements for application control devices .....	16
3.8.1	General .....	16
3.8.2	Mechanical requirements.....	16
3.8.3	Electrical requirements .....	16
3.9	Particular requirements for cellular network modems.....	16
3.9.1	General .....	16
3.9.2	Transceiver (Section 4.1 of 240-61266818) .....	17
3.9.3	Network Communications (Section 4.2 of 240-61266818) .....	17
3.9.4	Network Settings (Section 4.3 of 240-61266818) .....	17
3.9.5	Identity Modules (Section 4.4 of 240-61266818) .....	17
3.9.6	Firmware (Section 4.5 of 240-61266818) .....	17
3.9.7	User Indication (Section 4.6 of 240-61266818) .....	17
3.9.8	Diagnostics (Section 4.7 of 240-61266818).....	17
3.9.9	Modem Security (Section 4.8 of 240-61266818) .....	17
3.9.10	Power Supply .....	17
3.9.11	Modem Enclosure .....	18
3.9.12	Modem Markings (Section 4.11 of 240-61266818).....	18
3.9.13	External Connections .....	18
3.9.14	Tests (Section 5 of 240-61266818) .....	18
3.9.15	Product Support (Section 6 of 240-61266818) .....	18
3.9.16	Documentation (Section 7 of 240-61266818) .....	18
3.9.17	Warranty (Section 8 of 240-61266818).....	18
4.	Authorization.....	19
5.	Revisions .....	19
6.	Development team .....	19
7.	Acknowledgements .....	19
Annex A	– Minimum and developmental phase requirements .....	20

Figures

Figure 1: Network Reference Architecture .....	10
Figure 2: Interoperability between HES and field devices .....	12

## **1. Introduction**

Eskom has adopted NRS049:2016 as its functional requirements specification for smart metering systems. While NRS049:2016 caters for Eskom's functional requirements, some clauses in NRS049:2016 apply only to municipalities and others are optional. It is therefore essential for Eskom to have a complementary standard that clarifies the applicability of various clauses of NRS049:2016 in Eskom to ensure that there is no confusion among potential vendors during the tendering process.

## **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: Network Gateway (NG)/Data Concentrator (DC), Customer Interface Unit (CIU), Appliance Control Device (ACD) 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. 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 **NRS049**. To clarify, NRS049:2016 will apply in totality, except where deviations are specified in this document.

#### **2.1.1 Purpose**

The purpose of this document is to ensure that while NRS049 is the de facto standards for smart metering systems, Eskom specific requirements deviating from NRS049:2016 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] IEC 62056-8-20 Electricity metering data exchange – The DLMS/COSEM suite – Part 8-20; Mesh communication profile for neighbourhood networks

**ESKOM COPYRIGHT PROTECTED**

- 
- [5] IEC 62056-8-5 Electricity metering data exchange – The DLMS/COSEM suite – Part 8-5: Narrow-band OFDM G3-PLC communication profile for neighbourhood networks
  - [6] IEEE 1901.2 2013 Standard for low-frequency (less than 500 kHz) narrowband power line communications for smart grid applications
  - [7] Narrowband OFDM PLC specifications for G3-PLC networks 2017 , G3-PLC Alliance
  - [8] NRS049:2016 Advanced metering infrastructure requirement for smart metering system
  - [9] SANS 1524-1 Electricity payment systems - Part 1: Payment meters
  - [10] Wi-SUN Alliance – Technical Profile Specification – Field Area Network – Version 1v00
  - [11] IEC 62055-52 Electricity metering - Payment systems - Part 52: Standard transfer specification - Physical layer protocol for a two-way virtual token carrier for direct local connection
  - [12] STS101-2 Standard Transfer Specification – Physical Layer Protocol for a two-way virtual token carrier for remote connection over DLMS/COSEM
  - [13] IDIS Interoperability specification – Package 2 – IP Profile Edition 2.0 (including G3-PLC), 03-09-2014
  - [14] IDIS Interoperability specification – Package 2 – Smart Metering Objects Edition 2.0 (including G3-PLC), 03-09-2014

### **2.2.2 Informative**

- [15] IEC 62051 Electricity metering - Glossary of terms
- [16] IEC 62053-52 Electricity metering equipment (AC) — Particular requirements — Part 52: Symbols.
- [17] 240-76619477 Eskom specification: Procedure for the Request For Modification (RFM) on prepaid meters
- [18] 240-76628631 Standard for sealing metering equipment
- [19] 240-85106861 Standard for adopted open protocols for Eskom advanced meters
- [20] BS 7856 Code of practice for Design of alternating current, watthour meters for active energy (classes 1 and 2)
- [21] IEC 60529 Degrees of protection provided by enclosures
- [22] IEC 60950-1 Information technology equipment - Safety Part 1: General requirements
- [23] IEC 62055-21 Electricity metering - Payment systems - Part 21: Framework for standardisation
- [24] IEC 62055-51 Electricity metering - Payment systems - Part 51: Standard transfer specification - Physical layer protocol for one-way numeric and magnetic card token carriers
- [25] ISO 9001 Quality Management Systems.
- [26] SANS 1524-1-2 Electricity payment systems - Part 1-2: Specification for surge arresters for the protection of electricity dispensers
- [27] SANS 1524-4 Electricity payment systems - Part 4: National prepayment electricity meter cards
- [28] SANS 15417 Information technology: Automatic identification and data capture techniques - Code 128 bar code symbology specification
- [29] SANS 156 Moulded-case circuit-breakers
- [30] ST 240-76619489 Eskom specification: Accelerated Environmental Stress Test for Solid State Electricity Metering Equipment
- [31] STS 202-4 Standard Transfer Specification – Addendum to IEC 62055-52: Electricity metering – Payment systems – Part 52: Standard transfer Specification (STS) – Physical layer protocol for a two-way virtual token carrier for direct local connection

**ESKOM COPYRIGHT PROTECTED**

- [32] STS201-15.1.2 Standard Transfer Specification – Companion specification – Meter function object: RegisterTable for payment meters
- [33] STS202-1 Standard Transfer Specification - Addendum to IEC62055-41 electricity metering payment systems – Currency Token
- [34] STS202-2 Standard Transfer Specification - Addendum to IEC62055- 41: Standard transfer specification (STS)– Common Coded PAN for 2 and 4 Digit Manufacturer Codes
- [35] STS202-3: Standard Transfer Specification - Addendum to IEC62055- 41: Payment Systems - Standard Transfer Specification (STS)
- [36] IETF RFC 6550 IPv6 routing protocol for low-power and lossy networks.
- [37] IEEE 802.15.4g-2012, Part 15.4: Low-rate wireless personal area networks (LR-WPANs) Amendment 3: Physical layer (PHY) Specifications for low-data-rate, wireless, smart metering utility networks.
- [38] ITU-T G.9903 Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks (2014)

## 2.3 Definitions

### 2.3.1 General

Definition	Description
<b>Appliance control</b>	Process by which a customer and/or the utility can connect or disconnect specific appliances to/from the supply or modify the operation of specific appliances upon command via the customer communications gateway or an in-house controller [SANS 62051]
<b>COSEM</b>	Companion Specification for Energy Metering” - sets the rules, based on existing standards, for data exchange with energy meters
<b>Customer interface Unit (CIU)</b>	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.
<b>Data Concentrator</b>	Intelligent device in a 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.
<b>DLMS</b>	Device Language Message specification” - a generalised concept for abstract modelling of communication entities
<b>IDIS</b>	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.
<b>Interoperability</b>	Interoperability is the ability of a system to exchange data with other systems of different types and/or from different manufacturers.
<b>Measurement Unit (MU or MCU)</b>	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.

Definition	Description
<b>Network Gateway</b>	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 Ed.2 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.
<b>PLC</b>	Power line communication or power line carrier (PLC), also known as Power line Digital Subscriber Line (PDSL), mains communication, power line telecom (PLT), power line networking (PLN), or Broadband over Power Lines (BPL) are systems for carrying data on a conductor also used for electric power transmission.
<b>Power Limiting</b>	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.
<b>Split Meter</b>	Meter where the Measurement Unit and Customer interface Unit are contained in separate enclosures.
<b>Modular on-board modem</b>	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
<b>ACD</b>	Appliance Control Device
<b>APDU</b>	Application Protocol Data Unit
<b>COSEM</b>	Companion Specification for Energy Metering
<b>DC</b>	Data Concentrator
<b>DLMS</b>	Device Language Message Specification
<b>DLMS UA</b>	DLMS User Association
<b>ERPS</b>	Enterprise Resource Planning System
<b>GPRS</b>	General Packet Radio Service
<b>GSM</b>	Global System for Mobile Communications
<b>HAS</b>	Home Automation System
<b>HES</b>	Head-End System
<b>HHU</b>	Hand Held Unit

**ESKOM COPYRIGHT PROTECTED**



Abbreviation	Description
IoT	Internet Of Things
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LNAP	Local Network Access Point
Mbus	Meter Bus
NG	Network Gateway
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
NRS	National Rationalised Specification
NTC	Numeric Token Carrier
PLC	Power Line Carrier
RF	Radio Frequency
POS	Point Of Sale
RPL	IPv6 Routing Protocol for Low-Power and Lossy Networks
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. Requirements for smart metering system**

- Where the requirements in this document deviate from the requirements in NRS049:2016, the requirements in this document shall prevail.
- Where a specific requirement in this document is not a minimum requirement but stipulated as a developmental phase or future requirement the supplier shall ensure that the hardware of supplied devices (meters, ACD, NG and HES) 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 Communication requirements

#### 3.1.1 Network reference architecture

The requirements of clause 4.1 in NRS 049 shall apply. However, in reference to Table 1 in NRS049:2016; a Cb interface is not a mandatory requirement for meters with a G1 interface for standalone applications.

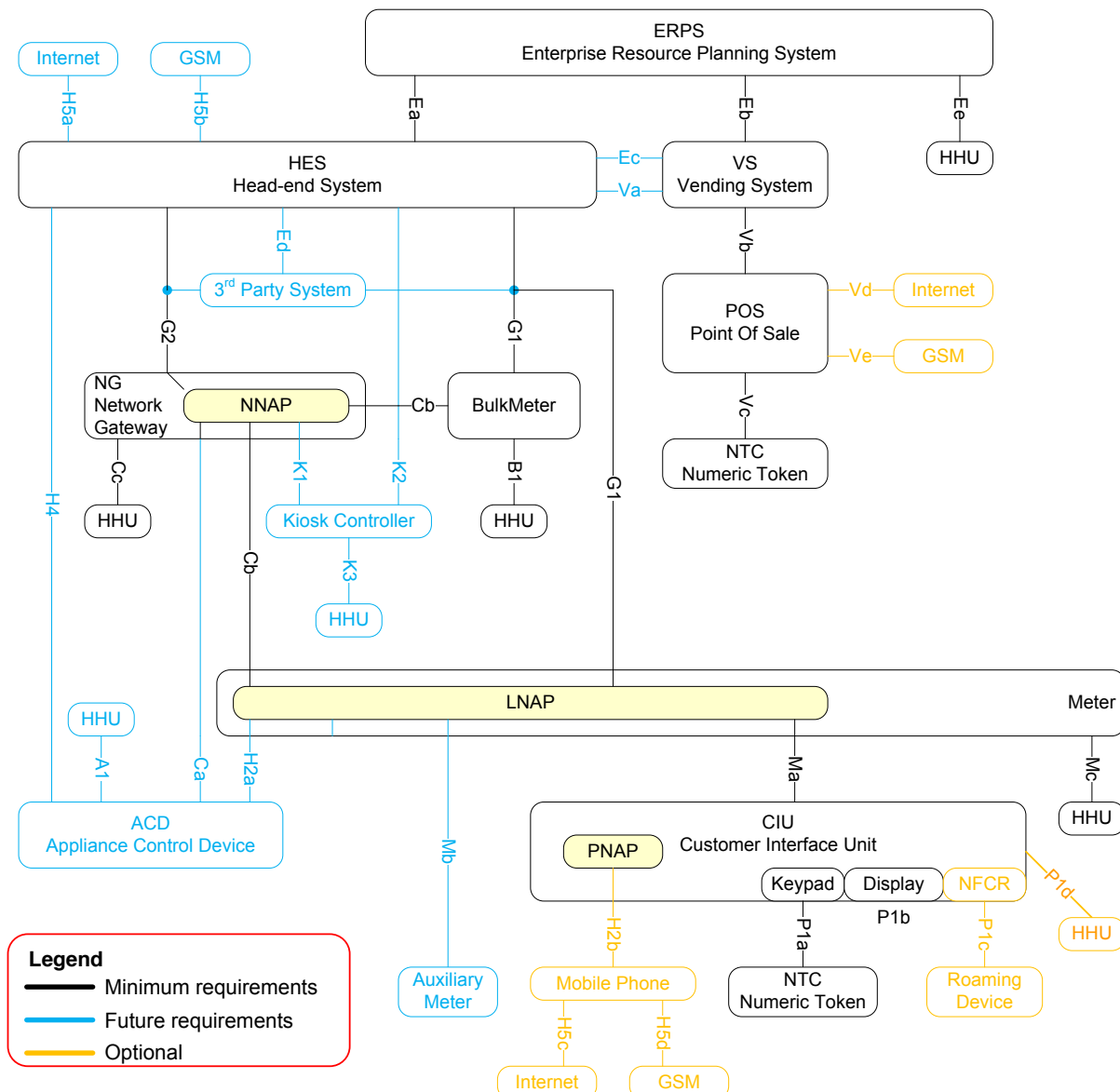


Figure 1: Network Reference Architecture

#### 3.1.2 Network routing

The requirements of NRS049:2016 clause 4.2 shall apply with the following conditions:

- IEEE 1901.2 (Netricity) is the specified PLC technology in NRS049 Ed. 2 but G3-PLC may also be used for the Ca, Cb, Ma and H2a interfaces.
- Where G3-PLC is used, OSI Layer 2 routing using LOADng may be used instead of Layer 3 routing based on RPL (RFC 6550).

- The implementation of the detail under clause 4.2 of NRS 049 Ed.2 is meant to be defined in a future national companion specification and is left to the discretion of the smart metering system manufacturer/vendor. The manufacturer/vendor shall refer to IEC 62056-8-20 when implementing Wi-SUN and/or Netricity (IEEE 1901.2) and IEC 62056-8-5 when implementing G3-PLC.

### **3.1.3 Network topologies**

The requirements of NRS049:2016 clause 4.3 shall apply. Additionally when implementing G3-PLC products the NNAP can be implemented as either a network gateway or data concentrator as defined in clause 9.1 of IEC 62056-8-5.

### **3.1.4 Standard interface**

- The requirements of NRS049:2016 clause 4.4 shall apply with the following conditions:
  - IEEE 1901.2 (Netricity) is the specified PLC technology in NRS049 Ed. 2 but G3-PLC may also be used for the Ca, Cb, Ma and H2a interfaces.
  - The Ma-interface protocol can be implemented using proprietary messaging. However the lower layers of the Ma-interface protocol stack shall be either IEEE1901.2 (Netricity), G3-PLC or IEEE 802.15.4g RF (Wi-SUN)
- Hard wired communication connections between the CIU and the meter shall **not** be considered for Eskom purposes. The same apply to ACD and any other device that interfaces with the meter.
- It is preferred that G2 be implemented as an open interface according to clause 4.4.13 of NRS 049 Ed.2. However a proprietary implementation may accepted here on condition that:
  - The HES vendor agrees to integrate third party data concentrators, initially, and, thereafter, to implement an open G2 interface according 4.4.13 of NRS 049 Ed.2 within a period of 12 months.
  - The data concentrator agrees to share details of its proprietary G2 protocol enable integration with a third party HES, initially, and, thereafter, to implement an open G2 interface according 4.4.13 of NRS 049 Ed.2 within a period of 12 months.
- The smart metering system shall support at least the following minimal set of DLMS Application Layer services as defined in IEC 62056-5-3:
  - General-protection
  - General-block-transfer
  - Block-transfer-with-get
  - Block-transfer-with-set
  - Multiple-references
  - Data-Notification
  - Get
  - Set
  - Selective-Access
  - Action
- For additional requirements pertaining to the application layer please see clause 3.3.3 herein.
- Security Suite 1 of IEC 62056-5-3 for encryption of DLMS data packets is required as per clause 4.4 of NRS049:2016 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. The supplier/vendor shall ensure from the design that there is enough processing capability in their product to support Security Suite 1.

- The IEC 62056-9-1 is the preferred adaption layer for G2 interface for implementation in the HES and the data concentrator. However initially a proprietary adaptation layer can implemented for the G2 interface on condition that it can be upgraded to IEC 62056-9-1 in future without need for change of existing hardware and processing capability.

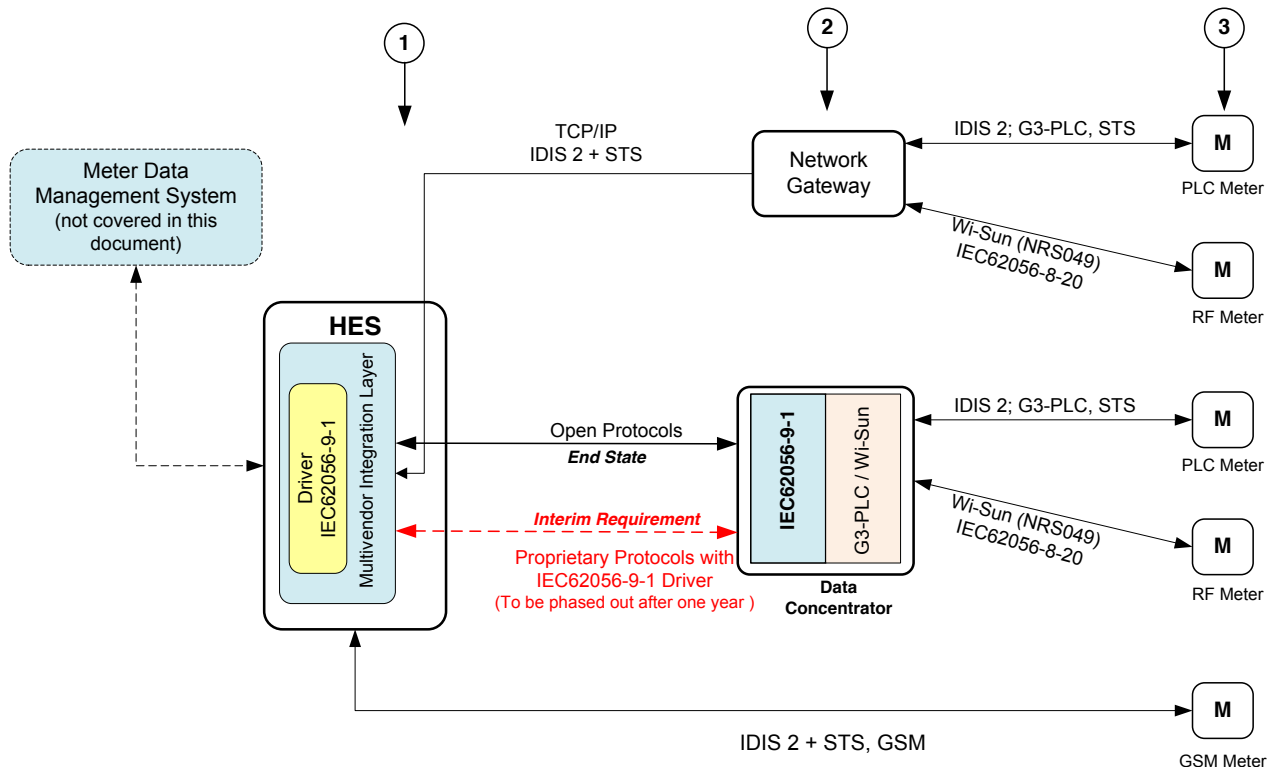


Figure 2: Interoperability between HES and field devices

### 3.1.5 Interface certification

The requirements of NRS049:2016 clause 4.5 shall apply including the following requirements:

- Each implementation of DLMS/CoSEM shall be certified by the DLMS UA for conformance.
- Each implementation of G3-PLC shall be certified by the G3-PLC Alliance for conformance.
- Each implementation of IEEE1901.2 (PLC) and/or IEEE 802.15.4g (RF) shall be certified by the Wi-SUN alliance for conformance.

## 3.2 Security requirements

### 3.2.1 General requirements

The requirements of NRS049:2016 clause 5.1 shall apply.

### 3.2.2 Device security requirements

The requirements of NRS049:2016 clause 5.2 shall apply.

### 3.2.3 Initial key management for server

The requirements of NRS049:2016 clause 5.3 shall apply.

### 3.2.4 Initial key management for HHU

The requirements of NRS049:2016 clause 5.4 shall apply.

### 3.2.5 Initial key management for CIU

The requirements of NRS049:2016 clause 5.5 shall apply.

### 3.2.6 Client/server key agreement

The requirements of NRS049:2016 clause 5.6 shall apply.

## 3.3 Functional requirements

### 3.3.1 Performance and availability requirements

The requirements of NRS049:2016 clause 6.1 shall apply.

### 3.3.2 Use cases

The requirements of NRS049:2016 clause 6.2 shall apply. Deviations to this clause are clarified below:

- a) The requirements of NRS049:2016 clause 6.2 shall apply to both currency and kWh credit when the meter is operating in prepayment mode.
- b) In addition to the requirements of NRS049:2016 clause 6.2.6.1, the default values shall be 30 minutes. Six (6) channels of load profiling memory shall be provided for to record: kWh import, kWh export, kVArh Q1, kVArh Q2, kVArh Q3 and kVArh Q4. It is preferred that cumulative energy register values are stored in load profile memory.
- c) The requirements of NRS049:2016 clause 6.2.7 are optional. In addition reference standard for M-Bus communication with auxiliary meters (IEC 62056-7-3) shall apply.
- d) The requirements of NRS049:2016 clause 6.2.9.13 are optional. Where requirements of NRS049:2016 clause 6.2.9.13 are implemented in the meter, it shall be possible for the utility to enable/disable such functionality.
- e) Where and when appliance control devices are implemented, the requirements of NRS049:2016 clause 6.2.10 shall apply.
- f) Under clause 6.2.14.5 of NRS049:2016, **Ma** is mandatory and **P1d** is optional. Manual pairing of the CIU and the meter is preferred.
- g) The requirements of NRS049:2016 clauses 6.2.14.16 and 6.2.14.17 shall apply.
- h) The requirements of NRS049:2016 clause 6.2.16 are optional.
- i) In addition to the clause 6.2.17 of NRS049:2016, the requirements stipulated in the utility URS documents for the HES and MDMS shall apply.
- j) Where the MCU does not have local display, a port (e.g. optical port) shall be provide on the MCU for the purpose of local interrogation and configuration of the meter by using an HHU. The supplier shall provide Eskom with at least one applicable when the meters are supplied

### 3.3.3 Meter COSEM interface objects

The requirements of NRS049:2016 clause 6.3 shall apply. However an implementation combining the following, shall also be accepted as a basis for future compliance with clause 6.3 of NRS 049:2016:

- *IDIS Package 2 Smart Metering Objects*,
- *Payment Metering Objects* (defined in DLMS UA Blue Book Ed.12.1)
- STS standards (i.e. IEC 62055-41 Ed.2, STS 101-2 and STS 202-1)

**ESKOM COPYRIGHT PROTECTED**

### **3.3.4 Appliance control device COSEM interface objects**

The requirements of NRS049:2016 clause 6.4 shall apply.

### **3.3.5 Kiosk controller COSEM interface objects**

The requirements of NRS049:2016 clause 6.5 shall apply.

### **3.3.6 Mobile phone/CIU application layer functions**

The requirements of NRS049:2016 clause 6.6 shall apply.

### **3.3.7 Network gateway application layer functions**

The requirements of NRS049:2016 clause 6.7 shall apply. In the context of NRS 049 Ed.2 the term Network Gateway refers to a Data Concentrator. The Network Gateway or Data Concentrator shall have some storage capacity to meter events and billing data.

### **3.3.8 Functional certification**

The requirements of NRS049:2016 clause 6.8 shall apply.

## **3.4 General requirements for meter, CIU, NG and ACD devices**

### **3.4.1 General requirements for meter, CIU, NG and ACD devices**

The requirements of NRS049:2016 clause 7.1 shall apply.

### **3.4.2 Mechanical requirements for meter, CIU, NG and ACD devices**

The requirements of NRS049:2016 clause 7.2 shall apply.

### **3.4.3 Climatic requirements for meter, CIU, NG and ACD devices**

The requirements of NRS049:2016 clause 7.3 shall apply.

### **3.4.4 Electrical requirements for meter, CIU, NG and ACD devices**

The requirements of NRS049:2016 clause 7.4 shall apply.

## **3.5 Particular requirements for meters**

### **3.5.1 General requirements for meters**

The requirements of NRS049:2016 clause 8.1 shall apply.

### **3.5.2 Mechanical requirements for meters**

The requirements of NRS049:2016 clause 8.2 shall apply.

### **3.5.3 Climatic requirements for meters**

The requirements of NRS049:2016 clause 8.3 shall apply.

### **3.5.4 Electrical requirements for meters**

The requirements of NRS049:2016 clause 8.4 shall apply.

In addition, the following requirements shall apply:

**ESKOM COPYRIGHT PROTECTED**

**Single phase meters:**

- Basic Current: 10A or less
- Maximum Current: at least 80A

**Three phase meters (25 and 50kVA)**

- Basic Current: 10A or less per phase
- Maximum Current: at least 80A per phase

**Three phase meters (100 kVA)**

- Basic Current: 20A or less per phase
- Maximum Current: at least 150A per phase

The withstand voltage for single phase shall be 400V.

### **3.5.5 Metering accuracy requirements**

The requirements of NRS049:2016 clause 8.5 shall apply. In addition, accuracy class 1 or better according to SANS 62053-21 is required for metering devices.

### **3.5.6 Time keeping requirements for meters**

The requirements of NRS049:2016 clause 8.6 shall apply.

### **3.5.7 Handheld Unit for local interrogation of meter**

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

### **3.5.8 Software**

#### **3.5.8.1 General Software Requirements**

- a) The metering systems shall be supplied with configuration software.
- b) All software supplied with the system shall be documented comprehensively, with all the features and functions discussed, including a set of examples as to how the meters can be configured for different tariff structures and applications. Included in the documentation shall be a list of possible problems and how to solve them.
- c) Eskom shall be given an Eskom wide licence agreement for all software offered.
- d) Future revisions of software shall be supplied in terms of a contract but shall be submitted in accordance with Eskom standard 240-76624509.

#### **3.5.8.2 Security within the software**

- a) Security measures, such as a hierarchical password system shall prevent the configuration information, in the meter and the configuration software, from being changed by unauthorised personnel.
- b) Three levels of security will be provided within the software to enable the following functions:
  - 1) Read only mode whereby all the registers within the meter may be read.
  - 2) Reading and programming access to the meter.
  - 3) Reading, programming and configuration access.

- c) Within the access to programming of the meter it must be further possible to only configure the following parameters without changing any of the other parameters within the meter:
- 1) Time and date

### **3.6 Particular requirements for customer interface units**

#### **3.6.1 General requirements for customer interface units**

The requirements of NRS049:2016 clause 9.1 shall apply

#### **3.6.2 Mechanical requirements for customer interface units**

The requirements of NRS049:2016 clause 9.1 shall apply.

#### **3.6.3 Electrical requirements for customer interface units**

The requirements of NRS049:2016 clause 9.1 shall apply. Where the CIU make use of batteries, user replaceable batteries are required.

### **3.7 Particular requirements for network gateways**

#### **3.7.1 General**

The requirements of NRS049:2016 clause 10.1 shall apply.

#### **3.7.2 Mechanical requirements**

- a) The requirements of NRS049:2016 clause 10.2 shall apply.
- b) The network gateway shall have two Ethernet ports for configuration purposes and future telecommunication requirements

#### **3.7.3 Electrical requirements**

The requirements of NRS049:2016 clause 10.3 shall apply.

### **3.8 Particular requirements for application control devices**

#### **3.8.1 General**

The requirements of NRS049:2016 clause 11.1 shall apply.

#### **3.8.2 Mechanical requirements**

The requirements of NRS049:2016 clause 11.1 shall apply.

#### **3.8.3 Electrical requirements**

The requirements of NRS049:2016 clause 11.1 shall apply.

### **3.9 Particular requirements for cellular network modems**

#### **3.9.1 General**

Cellular Network Modems are required for communication between the HES and network gateway as well as stand-alone metering installations. Both modular on-board modems and external modems are acceptable.

The requirements as specified in the latest version of "240-61266818: Specification for Cellular Network Modems for Remote Metering" shall fully apply for external modems. However, the following is applicable:

**ESKOM COPYRIGHT PROTECTED**



- MV90 shall be replaced with HES throughout the document
- The word meter refers to both a meter and a network gateway when used in in section 3.9 of this document.
- Requirement 4.6.2 (a) of 240-61266818 also includes distinguishing indications between the different packet switched technologies, i.e. GPRS, Edge, 3G or LTE.

For modular on-board modems, the requirements as stipulated in this document shall apply. Document 240-61266818 (latest version) shall be read in conjunction with the requirements below.

### **3.9.2 Transceiver (Section 4.1 of 240-61266818)**

The requirements for both the GSM module and Modems under section 4.1 of 240-61266818 shall apply.

### **3.9.3 Network Communications (Section 4.2 of 240-61266818)**

The requirements for network communications under section 4.2 of 240-61266818 shall apply.

### **3.9.4 Network Settings (Section 4.3 of 240-61266818)**

The requirements for network settings under section 4.3 of 240-61266818 shall apply.

### **3.9.5 Identity Modules (Section 4.4 of 240-61266818)**

The requirements for Identity modules under section 4.4 of 240-61266818 shall apply. In addition, the following requirements shall apply.

- 3.9.5.1** The SIM card slot (s) of removable SIM modems shall be easily accessible and located such that the SIM(s) can be easily replaced.

### **3.9.6 Firmware (Section 4.5 of 240-61266818)**

The requirements for firmware under section 4.5 of 240-61266818 shall apply.

### **3.9.7 User Indication (Section 4.6 of 240-61266818)**

The requirements for user indication under section 4.6 of 240-61266818 shall apply. The following clarification applies for 4.6.2 a):

Indications of the various cellular network mode statuses also includes distinguishing between the different packet switched technologies, i.e. GPRS, Edge, 3G or LTE.

### **3.9.8 Diagnostics (Section 4.7 of 240-61266818)**

The requirements for diagnostics under section 4.7 of 240-61266818 shall apply.

### **3.9.9 Modem Security (Section 4.8 of 240-61266818)**

The requirements for modem security under section 4.8 of 240-61266818 shall apply.

### **3.9.10 Power Supply**

The requirements below shall apply for modular on-board modems:

- a) The modem shall be internally powered from the meter or network gateway power supply.
- b) It is preferred that the modem, either through the power supply of the meter or network gateway, offers some type of power-down delay through a super-cap or similar, to enable alarm reporting under a power failure.

### **3.9.11 Modem Enclosure**

**3.9.11.1** Only modular on-board modems shall be acceptable.

**3.9.11.2** The modem shall be easily mountable and accessible.

**3.9.11.3** The insertion and removal of the modular on-board modem shall be such that it does not interfere with the wiring and or live operations of the NG and meter.

### **3.9.12 Modem Markings (Section 4.11 of 240-61266818)**

The requirements for modem markings under section 4.11 of 240-61266818 shall apply.

### **3.9.13 External Connections**

The requirements below shall apply for modular on-board modems:

**3.9.13.1** The RF connector shall be of SMA type (female) and be easily accessible.

**3.9.13.2** The RF connector shall have a non-reactive impedance of 50  $\Omega$ .

**3.9.13.3** The modem shall be configurable through the meter's or the network gateway's configuration port. Where this is not possible, the modem shall offer a configuration/diagnostic port that shall either be RS232 via an RJ12 or RJ45 connector or Ethernet.

**3.9.13.4** The meter and network gateway shall offer a data communication port for future connectivity of an external modem. It is preferred that this data communication port will be a serial port (RS232/RS485) for meters and an Ethernet port for the network gateway.

**3.9.13.5** The communication speed of the serial links shall be selectable as a minimum between 2 400 bps to a maximum of at least 57 600 bps.

**3.9.13.6** The supplier shall specify the connector to be used for programming, configuration and diagnostics.

**3.9.13.7** The supplier shall provide full details of any additional connectors the modem may have.

### **3.9.14 Tests (Section 5 of 240-61266818)**

The requirements for type and functional tests under section 5 of 240-61266818 shall apply.

### **3.9.15 Product Support (Section 6 of 240-61266818)**

The requirements for product support under section 6 of 240-61266818 shall apply.

### **3.9.16 Documentation (Section 7 of 240-61266818)**

The requirements for documents under section 7 of 240-61266818 shall apply.

### **3.9.17 Warranty (Section 8 of 240-61266818)**

The requirements for warranty under section 8 of 240-61266818 shall apply.

## **4. Authorization**

This document has been seen and accepted by:

<b>Name and surname</b>	<b>Designation</b>
R McCurrach	Senior Manager: PTM&C
Sikelela Mkhabela	Senior Manager Maintenance and Operations

## **5. Revisions**

<b>Date</b>	<b>Rev</b>	<b>Compiler</b>	<b>Remarks</b>
March 2018	1	ME Makwarela	Document revised to include requirements for the Head end System and modems
May 2017	Draft 0.1	ME Makwarela	Original document issued for comments

## **6. Development team**

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

- Andre Le Roux
- Deon Van Rooi
- Edison Makwarela
- Henri Groenewald
- Hylton Hiralal
- Jimmy O’Kennedy
- John Hope-Sotherton
- Mohammed Omar
- Reginald Brooks
- Shawn Papi
- Tebogo Modiba
- Wernher Schmidt

## **7. Acknowledgements**

Not Applicable

**Annex A – Minimum and developmental phase requirements**

240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
3.1.1	4.1	X	X	As specified in 240-126910106
3.1.2	4.2	X	X	
3.1.3	4.3	X	X	
3.1.4	4.4.1	X	X	
	4.4.2	X	X	
	4.4.3		X	
	4.4.4		X	
	4.4.5		X	
	4.4.6	X	X	
	4.4.7		X	
	4.4.8		X	
	4.4.9		X	
	4.4.10		X	
	4.4.11		X	
	4.4.12	X	X	
	4.4.13	X	X	Interface G2 between HES and NG
	4.4.13		X	Interface Ca between NG and ACD
	4.4.15	X	X	
	4.4.16		X	
	4.4.17		X	
	4.4.18	X	X	
	4.4.19	X	X	
	4.4.20	X	X	
	4.4.21		X	
	4.4.22	X	X	
	4.4.23	X	X	Only B1 is required. K1 & K2 are for future developments
	4.4.24	X	X	
	4.4.25		X	
	4.4.26		X	No required
	4.4.27		X	
	4.4.28		X	

**ESKOM COPYRIGHT PROTECTED**

240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
	4.4.29		X	Not required
	4.4.30		X	Not required
	4.4.31		X	
	4.4.32		X	
	4.4.33		X	
	4.4.34		X	
	4.4.35		X	
3.1.5	4.5	X	X	
3.2	5	X	X	
3.3.1	6.1	X	X	
3.3.2	6.2.1	X	X	
	6.2.2.1	X	X	
	6.2.2.2	X	X	
	6.2.3.1	X	X	
	6.2.3.1	X	X	
	6.2.3.2	X	X	
	6.2.3.3	X	X	
	6.2.3.4	X	X	
	6.2.3.5	X	X	
	6.2.3.6	X	X	
	6.2.4.1	X	X	
	6.2.4.2	X	X	
	6.2.4.3	X	X	
	6.2.4.4	X	X	
	6.2.4.5	X	X	
	6.2.4.6	X	X	
	6.2.4.7	X	X	
	6.2.5.1	X	X	The requirements of NRS049:2016 clause 6.2 shall apply to both currency and kWh credit for prepayment meters
	6.2.5.2	X	X	The requirements of NRS049:2016 clause 6.2 shall apply to both currency and kWh credit for prepayment meters
	6.2.5.3	X	X	The clause below in NR049 (6.2.5.) will be for future development "Customer active energy exported to the network is credited to the meter

ESKOM COPYRIGHT PROTECTED

240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
				account in accordance with a programmable single rate tariff applied in the meter"
	6.2.6.1	X	X	
	6.2.6.2	X	X	
	6.2.6.3	X	X	
	6.2.6.4	X	X	
	6.2.7		X	
	6.2.8.1	X	X	
	6.2.8.2	X	X	
	6.2.8.3	X	X	
	6.2.8.4	X	X	
	6.2.9.1	X	X	
	6.2.9.2	X	X	
	6.2.9.3	X	X	
	6.2.9.4	X	X	
	6.2.9.5	X	X	
	6.2.9.6	X	X	
	6.2.9.7	X	X	
	6.2.9.8	X	X	
	6.2.9.9	X	X	
	6.2.9.10	X	X	
	6.2.9.11.1	X	X	
	6.2.9.11.2	X	X	
	6.2.9.11.3	X	X	
	6.2.9.11.4	X	X	
	6.2.9.11.4.1	X	X	
	6.2.9.11.4.2	X	X	
	6.2.9.11.4.3	X	X	
	6.2.9.11.4.4	X	X	
	6.2.9.11.4.5	X	X	
	6.2.9.11.4.6	X	X	
	6.2.9.12.1	X	X	
	6.2.9.12.2	X	X	

ESKOM COPYRIGHT PROTECTED

240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
	6.2.9.12.3	X	X	
	6.2.9.12.4	X	X	
	6.2.9.12.5	X	X	
	6.2.9.13		X	
	6.2.10		X	
	6.2.11.1	X	X	
	6.2.11.2	X	X	
	6.2.11.3	X	X	
	6.2.11.4	X	X	
	6.2.12.1	X	X	
	6.2.12.2	X	X	
	6.2.12.3	X	X	
	6.2.12.4	X	X	
	6.2.12.5	X	X	
	6.2.12.6	X	X	
	6.2.12.7	X	X	
	6.2.13.1.1	X	X	
	6.2.13.1.1	X	X	pp, qq, rr, ss, tt & uu are reserved for future development
	6.2.13.2.1	X	X	
	6.2.13.2.2	X	X	
	6.2.13.2.2	X	X	
	6.2.13.3		X	
	6.2.13.4		X	
	6.2.14.1	X	X	
	6.2.14.2	X	X	
	6.2.14.3		X	
	6.2.14.4	X	X	
	6.2.14.5	X	X	
	6.2.14.6		X	
	6.2.14.7		X	
	6.2.14.8		X	
	6.2.14.9	X	X	
	6.2.14.10		X	

240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
	6.2.14.11	X	X	
	6.2.14.12	X	X	
	6.2.14.13	X	X	
	6.2.14.14	X	X	The HES downloads a new firmware image to the Meter or patch upgrades
	6.2.14.15	X	X	The HHU downloads a new firmware image to the Meter directly or via the DC to multiple meters
	6.2.14.16		X	
	6.2.14.17	X	X	
	6.2.14.18		X	
	6.2.14.19		X	
	6.2.14.20		X	
	6.2.14.21		X	
	6.2.14.22	X	X	
	6.2.14.23	X	X	
	6.2.14.24	X	X	
	6.2.14.25	X	X	
	6.2.14.26		X	
	6.2.14.27		X	
	6.2.15		X	
	6.2.16	X	X	Not required
	6.2.17.1	X	X	
	6.2.17.2	X	X	
	6.2.17.3	X	X	
	6.2.17.4	X	X	
	6.2.17.5	X	X	
	6.2.17.6	X	X	
	6.2.17.7	X	X	
	6.2.17.8	X	X	
	6.2.17.9	X	X	
	6.2.17.10	X	X	
	6.2.17.11	X	X	
	6.2.17.12	X	X	
	6.2.17.13	X	X	

ESKOM COPYRIGHT PROTECTED



240-126910106 Clause	NRS049 Clause	Minimum Requirements	Full Requirements /Future Development	Comments
	6.2.17.14	X	X	
	6.2.17.15	X	X	
	6.2.17.16	X	X	
	6.2.17.17	X	X	
3.3.3	6.3	X	X	
3.3.4	6.4		X	
3.3.5	6.5		X	
3.3.6	6.6		X	
3.3.7	6.7	X	X	
3.3.8	6.8	X	X	
3.4.1	7.1	X	X	
3.4.2	7.2	X	X	
3.4.3	7.3	X	X	
3.4.4	7.4	X	X	
3.5.1	8.1	X	X	
3.5.2	8.2	X	X	
3.5.3	8.3	X	X	
3.5.4	8.4	X	X	
3.5.5	8.5	X	X	
3.5.6	8.6	X	X	
3.6.1	9.1	X	X	
3.6.2	9.2	X	X	
3.6.3	9.3	X	X	
3.7.1	10.1	X	X	
3.7.2	10.2	X	X	
3.7.3	10.3	X	X	
3.8	11		X	