Smart Metering Implementation Programme

Smart Metering Equipment Technical Specifications

Version 1.1

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2 Revision History

Version	Date of Issue	Status	Change Summary
1.0	**18 December 2012**	**Final**	**First version (SMETS 1) designated by the Secretary of State**
1.1	**31 March 2014**	**Final**	**SMETS 1 as amended by the Secretary of State to clarify a small number of requirements following consultation**

3 Introduction

The requirement to install metering equipment in Great Britain which complies with these Smart Metering Equipment Technical Specifications (SMETS) arises from standard licence conditions 39and 40 in electricity supply licences and standard conditions 33 and 34 in gas supply licences.

Section 4 of this document describes the minimum physical, functional, interface and data requirements of a Gas Smart Metering System that a gas Supplier is required to install to comply with condition 33 of its licence.

Section 5 of this document describes the minimum physical, functional, interface and data requirements of an Electricity Smart Metering System that an electricity Supplier is required to install to comply with condition 39 of its licence.

Section 6 of this document describes the minimum physical, functional and interface requirements of an IHD installed to comply with condition 34 of the gas supply licence or condition 40 of the electricity supply licence.

This document has been designated by the Secretary of State on 18 December 2012 for the purposes of the relevant licence conditions. SMETS1 was notified to the European Commission in accordance with the requirements of Article 8 of Directive 98/34/EC of the European Parliament and of the Council laying down a procedure for the provision of information in the field of technical standards and regulations (OJ L 204, 21.7.1998, p. 37) as amended by Directive 98/48/EC of the European Parliament and of the Council (OJ L 217, 5.8.1998, p. 18).

This document should be read in conjunction with any other relevant supply licence conditions and with regard to the wider statutory and regulatory framework applying to devices installed for the purpose of energy supply to premises, for example; the Measuring Instruments (Active Electrical Energy Meters) Regulations 2006 and the Measuring Instruments (Gas Meters) Regulations 2006[1].

Mutual recognition: Any requirement for metering equipment to comply with the SMETS shall be satisfied by compliance with:

 i. a relevant standard or code of practice of a national standards body or equivalent body of any EEA State or Turkey; or

 ii. any relevant international standard recognised for use in any EEA State or Turkey; or

 iii. any relevant technical regulation with mandatory or de facto mandatory application for marketing or use in any EEA State or Turkey

in so far as compliance with the standard, code of practice or technical regulation in question enables the equipment to achieve, in an equivalent manner, all of the physical, functional, interface and data capabilities that are achieved by compliance with the requirements of SMETS.

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[1] These regulations transpose the Measuring Instruments Directive (2004/22/EC).

4 Gas Smart Metering System Technical Specification

4.1 Overview

This section sets out the minimum physical requirements, minimum functional requirements, minimum interface requirements and minimum data requirements of a Gas Smart Metering System (GSMS) installed to comply with the smart metering roll-out licence conditions (standard licence condition 33 of gas supply licences).

Any requirements set out in this section (§*4*), applicable to a Valve, only apply to Gas Smart Metering Systems installed at Domestic Premises.

For the avoidance of doubt, a GSMS may comprise one or more Devices provided that together they meet the minimum requirements of this section.

4.2 Physical requirements

A GSMS shall as a minimum include the following components:

i. a Clock;
ii. a Data Store;
iii. a Gas Meter;
iv. a HAN Interface;
v. a User Interface;
vi. a WAN Interface; and
vii. where installed at Domestic Premises, a Valve.

The GSMS shall include a power source. To the extent that it is mains powered, a GSMS shall be capable of:

viii. operating at a nominal voltage of 230VAC and consuming no more than an average of 1 watt of electricity under normal operating conditions; and
ix. automatically resuming operation after a power failure in its operating state prior to such failure.

Each Device forming part of the GSMS shall:

x. display the *Device Identifier(4.5.1.1)*; and
xi. have a Secure Perimeter.

The WAN Interface of a GSMS shall:

xii. be capable of being replaced without also requiring the replacement of the Gas Meter; and
xiii. support communications based on Open Standards.

The HAN Interface of a GSMS shall be capable of supporting communications based on Open Standards.

4.3 Functional requirements

This section sets out the minimum functions that a GSMS shall be capable of performing.

4.3.1 Clock

The Clock forming part of a GSMS shall be capable of operating so as to be accurate to within 10 seconds of UTC under normal operating conditions.

4.3.2 Communications

A GSMS shall be capable of establishing Communications Links via each of its interfaces (including its HAN Interface and its WAN Interface).

A GSMS, and any Device forming part of it, shall be capable of ensuring that the security characteristics of all Communications Links it establishes meet the requirements set-out in §*4.3.9.3*.

For all Commands received via any Communications Link the GSMS shall be capable of:

   i.   Authenticating to a Trusted Source the Command and on failure to so Authenticate, generating an entry in the *Security Log*(*4.5.3.11*) to that effect and discarding the Command without execution and without sending a Response;

   ii.   verifying that it is the intended recipient of the Command and if it is not the intended recipient, generating an entry in the *Security Log*(*4.5.3.11*) to that effect and discarding the Command without execution and without sending a Response;

   iii. verifying the validity of the contents and format of the Command and if invalid, sending a Response to that effect via its WAN Interface; and

   iv. on detection of Unauthorised access of the nature described in *§4.3.9.3* discarding the Command without execution and without sending a Response.

4.3.2.1 Communications with Consumer Devices over the HAN Interface

A GSMS shall be capable of establishing a Communications Link via its HAN Interface with at least one Consumer Device that is capable of providing the Consumer with access to the information set-out in §*4.4.1*.

In establishing the Communications Link, the GSMS shall be capable of receiving Security Credentials to enable it to Authenticate the Consumer Device.

Where it has established a Communications Link with a Consumer Device the GSMS shall be capable of:

   i.   sending the information (set-out in §*4.4.1*) to the Consumer Device; and

   ii.   sending Alerts to the Consumer Device.

4.3.2.2 Communications with a HES over the WAN Interface

A GSMS shall be capable of establishing a Communications Link via its WAN Interface with a HES.

In establishing the Communications Link, the GSMS shall be capable of exchanging Security Credentials to enable mutual Authentication with the HES.

Where it has established a Communications Link with a HES the GSMS shall be capable of:

i.   receiving the Commands (set-out in §*4.4.3*) from the HES;
ii.   sending the Responses (set-out in §*4.4.3*) to the HES; and
iii. sending Alerts to the HES.

4.3.3 Data storage

A GSMS shall be capable of retaining all information held in its Data Store at all times, including on loss of power.

4.3.4 Display of information

A GSMS shall be capable of displaying the following up to date information on its User Interface:

i.   the *Payment Mode*(*4.5.2.12*) currently in operation, being Prepayment Mode or Credit Mode;
ii.   the *Tariff TOU Register Matrix*(*4.5.3.13*) and the *Tariff Block Counter Matrix*(*4.5.3.12*);
iii.   the *Meter Balance*(*4.5.3.6*);
iv.   whether Emergency Credit is available for activation;
v.   whether the GSMS has suspended the disablement of Supply during a period defined in the *Non-Disablement Calendar*(*4.5.2.11*) (as set-out in §*4.3.6.2*);
vi.   the *Emergency Credit Balance*(*4.5.3.4*) when Emergency Credit is activated;
vii.   any low credit condition;
viii. where a GSMS includes a Battery, any low Battery condition;
ix.   the Supply status, being Enabled or Disabled;
x.   any Time-based Debts and Time-based Debt Recovery rates;
xi.   any Payment-based Debt;
xii.   any accumulated debt recorded in the *Accumulated Debt Register*(*4.5.3.1*); and
xiii. any *Standing Charge(4.5.2.13)*.

A GSMS shall be capable of displaying Currency Units in GB Pounds and European Central Bank Euro.

4.3.5 Monitoring

4.3.5.1 Battery capacity

Where a GSMS includes a Battery, it shall be capable of estimating the remaining Battery capacity in days (to facilitate replacement of the Battery before it is fully depleted) and storing the estimate in *Remaining Battery Capacity*(*4.5.3.10*).

If the *Remaining Battery Capacity*(*4.5.3.10*) falls below ten percent of the nominal Battery capacity the GSMS shall be capable of:

i.   generating an entry to that effect in the *Event Log*(*4.5.3.5*);
ii.   sending an Alert to that effect via its WAN Interface; and
iii. displaying an Alert to that effect on its User Interface.

4.3.5.2 GSMS power supply

Prior to or at the loss of power, a GSMS shall be capable of:

iv.   Disabling the Supply, in circumstances where the *Supply Depletion State*(*4.5.2.14*) is configured to require Disablement; and

v.   sending an Alert to that effect on its WAN Interface.

4.3.6 Payment Mode

A GSMS shall be capable of operating in Credit Mode and Prepayment Mode and of being remotely switched from one mode to the other.

4.3.6.1 Credit Mode

A GSMS when operating in Credit Mode shall be capable of maintaining a calculation of the *Meter Balance*(*4.5.3.6*) based on:

i.   the Consumption in the *Tariff TOU Register Matrix*(*4.5.3.13*) converted by *Calorific Value*(*4.5.2.2*) and *Conversion Factor*(*4.5.2.3*) multiplied by the Prices in the *Tariff TOU Price Matrix*(*4.5.2.21*) and, if operating Time-of-use with Block Pricing, additionally the Consumption in the *Tariff Block Counter Matrix*(*4.5.3.12*) converted by *Calorific Value*(*4.5.2.2*) and *Conversion Factor*(*4.5.2.3*) multiplied by the Prices in the *Tariff Block Price Matrix*(*4.5.2.18*); and

ii.   the *Standing Charge*(*4.5.2.13*),

and of displaying the *Meter Balance*(*4.5.3.6*) on its User Interface.

4.3.6.2 Prepayment Mode

A GSMS shall be capable of operating in Prepayment Mode, including during periods of loss of its Communications Link via its WAN Interface, and maintaining a balance of credit and reflecting any reduction in credit based on Consumption, standing charge and Time-based Debt Recovery.

A GSMS shall be capable of adding credit to the *Meter Balance*(*4.5.3.6*) (as set out in §*4.4.2.2* and §*4.4.3.2*) and reducing the amount of credit in the *Meter Balance*(*4.5.3.6*).

A GSMS shall be capable of making Emergency Credit available to the Consumer (by means of the *Emergency Credit Balance*(*4.5.3.4*)) if the *Meter Balance*(*4.5.3.6*) is below the *Emergency Credit Threshold*(*4.5.2.9*). The GSMS shall be capable of displaying the availability of Emergency Credit on its User Interface. The amount of Emergency Credit made available to the Consumer shall be equal to the amount of the *Emergency Credit Limit*(*4.5.2.8*). A GSMS shall be capable of reducing the amount of credit in the *Emergency Credit Balance*(*4.5.3.4*) in the case where Emergency Credit is activated by the Consumer (as set out in §*4.4.2.1* and §*4.4.3.1*) and the *Meter Balance*(*4.5.3.6*) is exhausted. Any Emergency Credit used shall be repaid when credit is added to the GSMS (as set out in §*4.4.2.2* and §*4.4.3.2*).

A GSMS shall be capable of reducing the *Meter Balance*(*4.5.3.6*) until exhausted followed by reducing the *Emergency Credit Balance*(*4.5.3.4*) until exhausted on the basis of:

i.   the Consumption in the *Tariff TOU Register Matrix*(*4.5.3.13*) converted by *Calorific Value*(*4.5.2.2*) and *Conversion Factor*(*4.5.2.3*) multiplied by the Prices in

the *Tariff TOU Price Matrix*(*4.5.2.21*) and, if operating Time-of-use with Block Pricing, additionally the Consumption in the *Tariff Block Counter Matrix*(*4.5.3.12*) converted by *Calorific Value*(*4.5.2.2*) and *Conversion Factor*(*4.5.2.3*) multiplied by the Prices in the *Tariff Block Price Matrix*(*4.5.2.18*);

ii.   the *Standing Charge*(*4.5.2.13*); and

iii.   the recovery of debt through each of the *Time Debt Registers [1 … 2]*(*4.5.3.14*) at rates by the *Debt Recovery Rates [1 … 2]*(*4.5.2.5*),

and the GSMS shall be capable of recording debt recovered in the *Billing Data Log*(*4.5.3.2*).

A GSMS shall be capable of monitoring the *Meter Balance*(*4.5.3.6*) and the activated *Emergency Credit Balance*(*4.5.3.4*) and:

iv.   if the combined credit of the *Meter Balance*(*4.5.3.6*) and *Emergency Credit Balance*(*4.5.3.4*) falls below the *Low Credit Threshold*(*4.5.2.10*), displaying an Alert to that effect on its User Interface and sending an Alert to that effect via its HAN Interface and WAN Interface;

v.   if the combined credit of the *Meter Balance*(*4.5.3.6*) and *Emergency Credit Balance*(*4.5.3.4*) falls below the *Disablement Threshold*(*4.5.2.7*), Disabling the Supply, displaying an Alert to that effect on its User Interface and sending an Alert to that effect via its HAN Interface and WAN Interface; and

vi.   suspending the Disablement of Supply during periods defined in the *Non-Disablement Calendar*(*4.5.2.11*) and displaying an indication that the Disablement of Supply has been suspended on its User Interface.

A GSMS shall be capable of controlling recovery of debt in cases where Emergency Credit is in use or the Supply is Disabled by:

vii.   suspending debt recovery when Emergency Credit is in use if configured by *Suspend Debt Emergency*(*4.5.2.17*) to do so; and

viii.   suspending debt recovery when the Supply is Disabled if configured by *Suspend Debt Disabled*(*4.5.2.16*) to do so.

In circumstances where the Supply is Disabled, a GSMS shall be capable of continuing to recover Time-based Debt (if so configured as set out in *viii* above) and *Standing Charge*(*4.5.2.13*), and recording the debt recovered in the *Accumulated Debt Register*(*4.5.3.1*).

4.3.7 Pricing

A GSMS shall be capable of applying Time-of-use Pricing and Time-of-use with Block Pricing, as configured by *Tariff Type*(*4.5.2.22*).

4.3.7.1 Time-of-use Pricing

A GSMS shall be capable of recording Consumption according to Time-of-use Bands in one of four Tariff Registers in the *Tariff TOU Register Matrix*(*4.5.3.13*).

A GSMS shall be capable of switching between different Tariff Registers once per Day. The switching between Time-of-use Bands and thus Tariff Registers shall be based on time of Consumption and switching rules defined in the *Tariff Switching Table*(*4.5.2.19*).

4.3.7.2 Time-of-use with Block Pricing

A GSMS shall be capable of recording Consumption according to Time-of-use Bands in one of four Tariff Registers in the *Tariff TOU Register Matrix*(*4.5.3.13*)*.*

A GSMS shall also be capable of accumulating Consumption in one of four Block Counters in the *Tariff Block Counter Matrix*(*4.5.3.12*) for the first Time-of-use Band. The GSMS shall be capable of switching between Block Counters according to the Consumption thresholds in the *Tariff Threshold Matrix*(*4.5.2.20*).

A GSMS shall be capable of switching between different Tariff Registers once per Day. The switching between Time-of-use Bands and thus Tariff Registers shall be based on time of Consumption and switching rules set out in the *Tariff Switching Table*(*4.5.2.19*).

4.3.8 Recording

4.3.8.1 Billing data

A GSMS shall be capable of taking a date and time stamped copy of and storing the *Tariff TOU Register Matrix*(*4.5.3.13*) and the *Tariff Block Counter Matrix*(*4.5.3.12*) in the *Billing Data Log*(*4.5.3.2*) in accordance with the timetable set out in the *Billing Calendar*(*4.5.2.1*) and then immediately resetting the Block Counters in the *Tariff Block Counter Matrix*(*4.5.3.12*) and if operating in Credit Mode immediately resetting the *Meter Balance*(*4.5.3.6*).

4.3.8.2 Daily read data

A GSMS shall be capable of taking a copy of and storing the *Tariff TOU Register Matrix*(*4.5.3.13*), the *Tariff Block Counter Matrix*(*4.5.3.12*) and the *Total Consumption Register*(*4.5.3.15*) together with a date and time stamp in the *Daily Read Log*(*4.5.3.3*) every Day at midnight UTC.

4.3.8.3 Half hour profile data

A GSMS shall be capable of recording Consumption in each thirty minute period (commencing at the start of minutes 00 and 30 in each hour), and recording details of the thirty minute period to which the Consumption relates, in the *Profile Data Log*(*4.5.3.9*).

4.3.8.4 Network data

A GSMS shall be capable of recording Consumption over each six minute period in the *Network Data Log*(*4.5.3.7*) for four hours and recording details of the six minute period to which the Consumption relates in the *Network Data Log*(*4.5.3.7*).

4.3.8.5 Total consumption

A GSMS shall be capable of recording cumulative Consumption in the *Total Consumption Register*(*4.5.3.15*).

4.3.9 Security

4.3.9.1 General

A GSMS shall be designed taking all reasonable steps so as to ensure that any failure or compromise of its Integrity shall not compromise the Security Credentials or Personal Data stored on it or compromise the Integrity of any other Device to which it is connected by means of a Communications Link.

Where a GSMS comprises more than one Device, each Device other than the Device containing the Gas Meter shall be capable of verifying the Integrity of its Firmware at power-on and prior to execution.

A GSMS shall be capable of logging in the *Security Log*(*4.5.3.11*) information on all Sensitive Events.

4.3.9.2 Physical

A GSMS shall be designed taking all reasonable steps so as to prevent Unauthorised Physical Access through its Secure Perimeter that could compromise the Confidentiality and/or Data Integrity of:

   i.   Personal Data;
   ii.   Security Credentials;
   iii. Random Number Generator;
   iv. Cryptographic Algorithms;
   v.   the Gas Meter; and
   vi. Firmware and data essential for ensuring its Integrity,

held or executing on the GSMS.

A GSMS shall be capable of detecting any attempt at Unauthorised Physical Access through its Secure Perimeter that could compromise such Confidentiality and/or Data Integrity and on such detection shall be capable of:

   vii. providing evidence of such an attempt through the use of tamper evident coatings or seals;

and where reasonably practicable:

   viii. generating an entry to that effect in the *Security Log*(*4.5.3.11*);
   ix.   sending an Alert to that effect via its WAN Interface; and
   x.   Disabling the Supply, in circumstances where the *Supply Tamper State*(*4.5.2.15*) is configured to require Disablement.

4.3.9.3 Communications

A GSMS shall be capable of preventing and detecting, on all of its interfaces, Unauthorised access that could compromise the Confidentiality and/or Data Integrity of:

   i.   Personal Data whilst being transferred via an interface;
   ii.   Security Credentials whilst being transferred via an interface; and
   iii. Firmware and data essential for ensuring its Integrity whilst being transferred via an interface,

and any Command that could compromise the Confidentiality and/or Data Integrity of:

   iv.   Personal Data;
   v.   Security Credentials; and
   vi.   Firmware and data essential for ensuring its Integrity,

held or executing on the GSMS, and on such detection shall be capable of:

   vii.   generating an entry to that effect in the *Security Log*(*4.5.3.11*); and
   viii.   sending an Alert to that effect via its WAN Interface.

A GSMS shall be capable of employing techniques to protect against Replay Attacks of information used to Authenticate the identity of a system or individual.

A GSMS shall not be capable of modifying entries from, or executing a Command to modify or delete entries from, the *Security Log*(*4.5.3.11*).

4.4 Interface requirements

This section sets out the minimum required interactions which a GSMS shall be capable of undertaking with Consumer Devices and a HES via its interfaces.

4.4.1 HAN Interface Consumer Device information provision

A GSMS shall be capable, immediately upon establishment of a Communications Link with a Consumer Device (as set out in §*4.3.2.1*), of providing the following information (and updates of any changes in the information every 30 minutes thereafter) to that Consumer Device:

   i.   the *Meter Balance*(*4.5.3.6*);
   ii.   the date and time of the last update of the *Meter Balance*(*4.5.3.6*);
   iii.   the Clock time in UTC;
   iv.   the *Total Consumption Register*(*4.5.3.15*);
   v.   the *Tariff TOU Register Matrix*(*4.5.3.13*) and *Tariff Block Counter Matrix*(*4.5.3.12*);
   vi.   the *Tariff Switching Table*(*4.5.2.19*);
   vii.   the *Daily Read Log*(*4.5.3.3*);
   viii.   the *Emergency Credit Balance*(*4.5.3.4*) if Emergency Credit is activated;
   ix.   the *Tariff TOU Price Matrix*(*4.5.2.21*) and *Tariff Block Price Matrix*(*4.5.2.18*) with an indication of the active Tariff Price;
   x.   the Time-based Debts from the *Time Debt Registers [1 … 2]*(*4.5.3.14*);
   xi.   the Time-based Debt Recovery rates from the *Debt Recovery Rates [1 … 2]*(*4.5.2.5*);
   xii.   the Payment-based Debt from the *Payment Debt Register*(*4.5.3.8*);
   xiii.   the accumulated debt from the *Accumulated Debt Register*(*4.5.3.1*);
   xiv.   the *Low Credit Threshold*(*4.5.2.10*);
   xv.   the *Calorific Value*(*4.5.2.2*);
   xvi.   the *Conversion Factor*(*4.5.2.3*);
   xvii.   the *Profile Data Log*(*4.5.3.9*); and
   xviii.   the *Payment Mode(4.5.2.12)*.

4.4.2 User Interface Commands

A GSMS shall be capable of executing immediately the Commands set out in this section (§*4.4.2*) following their receipt via its User Interface.

The GSMS shall be capable of logging all such Commands received and Outcomes in the *Event Log*(*4.5.3.5*).

4.4.2.1 Activate Emergency Credit

A Command to activate Emergency Credit (when the GSMS is operating in Prepayment Mode) if Emergency Credit is available (as set-out in §*4.3.6.2*).

In executing the Command, if the Supply is Disabled, the GSMS shall be capable of Arming the Valve and Enabling the Supply.

4.4.2.2 Add Credit

A Command to add credit to the GSMS (when the GSMS is operating in Prepayment Mode) on input of a UTRN. In executing the Command, the GSMS shall be capable of:

    i.   verifying the Authenticity of the UTRN;
    ii.   verifying that the GSMS is the intended recipient of the UTRN;
    iii.   rejecting duplicate presentation of the same UTRN; and
    iv.   controlling the number of invalid UTRN entries processed.

The GSMS shall be capable, on failure of any of *i* to *iv* above, of generating an entry in the *Security Log*(*4.5.3.11*) to that effect.

In executing the Command, the GSMS shall be capable of applying the credit added in the following order:

    v.   recovery of Payment-based Debt of an amount defined by *Debt Recovery per Payment*(*4.5.2.4*) from the *Payment Debt Register*(*4.5.3.8*) subject to the *Debt Recovery Rate Cap*(*4.5.2.6*);
    vi.   recovery of debt accumulated in the *Accumulated Debt Register*(*4.5.3.1*);
    vii.   repayment of Emergency Credit activated and used by Consumer; and
    viii. adding remaining credit (the credit after deduction of *v*, *vi* and *vii* above) to the *Meter Balance*(*4.5.3.6*).

In executing the Command, the GSMS shall be capable of Arming the Valve if the *Meter Balance*(*4.5.3.6*) rises above the *Disablement Threshold*(*4.5.2.7*) and displaying any such change in state of the Valve on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

In executing the Command, the GSMS shall be capable of recording the credit added to the *Meter Balance*(*4.5.3.6*) in the *Billing Data Log*(*4.5.3.2*).

4.4.2.3 Enable Supply

A Command to Enable the Supply if the Valve is Armed.

In executing the Command, the GSMS shall be capable of detecting when the flow rate exceeds a level defined by *Uncontrolled Gas Flow Rate*(*4.5.2.23*) and in the case

the flow rate is exceeded, of closing the Valve and then Arming the Valve and sounding an Alarm via its User Interface.

4.4.3 WAN Interface Commands

A GSMS shall be capable of executing the Commands set out in this section (§*4.4.3*).

A GSMS shall be capable of executing Commands within 30 minutes of their receipt ("immediate Commands"). A GSMS shall be capable of executing certain Commands at a future date ("future dated Commands"). A future dated Command shall include a date and time at which the Command shall be executed by the GSMS.

A GSMS shall be capable of sending a Response containing the Outcome on execution of an immediate Command.

A GSMS shall be capable of sending a Response acknowledging receipt of a future dated Command immediately upon its receipt. A GSMS shall be capable of sending a Response containing the Outcome at the future date and time of execution of a future dated Command.

A GSMS shall be capable of over-writing an outstanding future dated Command on receipt of a new future dated Command of the same type. A future dated Command shall be capable of being cancelled by an Authorised party. A GSMS shall be capable of cancelling a future dated Command upon receipt of an immediate Command of the same type. A GSMS shall be capable of sending an Outcome including the reason for failure of a future dated Command in the event that it has been over-written or cancelled.

A GSMS shall be capable of logging all such Commands received and Outcomes in the *Event Log*(*4.5.3.5*).

4.4.3.1 Activate Emergency Credit

A Command to activate Emergency Credit (when the GSMS is operating in Prepayment Mode) if Emergency Credit is available (as set-out in §*4.3.6.2*).

In executing the Command, if the Supply is Disabled, the GSMS shall be capable of Arming the Valve.

4.4.3.2 Add Credit

A Command to add credit to the GSMS (when the GSMS is operating in Prepayment Mode) on input of a UTRN. In executing the Command, the GSMS shall be capable of applying the credit added in the following order:

i.   recovery of Payment-based Debt of an amount defined by *Debt Recovery per Payment*(*4.5.2.4*) from the *Payment Debt Register*(*4.5.3.8*) subject to the *Debt Recovery Rate Cap*(*4.5.2.6*);

ii. recovery of debt accumulated in the *Accumulated Debt Register*(*4.5.3.1*);

iii. repayment of Emergency Credit activated and used by the Consumer; and

iv. adding remaining credit (the credit after deducting *i*, *ii* and *iii* above) to the *Meter Balance*(*4.5.3.6*).

In executing the Command, the GSMS shall be capable of Arming the Valve if the *Meter Balance*(*4.5.3.6*) rises above the *Disablement Threshold*(*4.5.2.7*) and displaying

any such change in state of the Valve on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

In executing the Command, the GSMS shall be capable of recording the credit added to the *Meter Balance*(*4.5.3.6*) in the *Billing Data Log*(*4.5.3.2*).

4.4.3.3 Adjust Debt

A Command to apply positive and negative adjustments to the *Time Debt Registers [1 … 2]*(*4.5.3.14*) and the *Payment Debt Register*(*4.5.3.8*) (when operating in Prepayment Mode).

4.4.3.4 Adjust Meter Balance

A Command to apply positive and negative adjustments to the *Meter Balance*(*4.5.3.6*).

If the GSMS is operating in Prepayment Mode and, following any such adjustment, if the *Meter Balance*(*4.5.3.6*) rises above the *Disablement Threshold*(*4.5.2.7*), the GSMS shall be capable of Arming the Valve and displaying any such change in state of the Valve on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

4.4.3.5 Arm Valve

A Command to Arm the Valve.

4.4.3.6 Clear Event Log

A Command to clear all entries from the *Event Log*(*4.5.3.5*).

4.4.3.7 Disable Supply

A Command to Disable the Supply.

4.4.3.8 Read Configuration Data

A Command to read the value of one or more of the configuration data items set out in §*4.5.2*.

In executing the Command, the GSMS shall be capable of sending such value(s) in a Response via its WAN Interface.

4.4.3.9 Read Constant Data

A Command to read the value of one or more of the constant data items set out in §*4.5.1*.

In executing the Command, the GSMS shall be capable of sending such value(s) in a Response via its WAN Interface.

4.4.3.10   Read Operational Data

A Command to read the value of one or more of the operational data items set out in §*4.5.3*.

In executing the Command, the GSMS shall be capable of sending such value(s) in a Response via its WAN Interface.

4.4.3.11   Restrict Data

A Command to mark configuration and/or operational data as restricted so as to prevent its disclosure on its HAN Interface and its User Interface.

4.4.3.12   Set Payment Mode

A Command to set the payment mode as either Prepayment Mode or Credit Mode and to record the mode of operation in *Payment Mode(4.5.2.12)*.

In executing the Command, the GSMS shall be capable of recording:

  i.   the *Tariff TOU Register Matrix(4.5.3.13)*;
  ii.   the *Tariff Block Counter Matrix(4.5.3.12)*;
  iii. the *Meter Balance(4.5.3.6)*;
  iv.   the *Emergency Credit Balance(4.5.3.4)*;
  v.   the *Payment Debt Register(4.5.3.8)*;
  vi.   the *Time Debt Registers [1 … 2](4.5.3.14)*; and
  vii. the *Accumulated Debt Register(4.5.3.1)*,

in the *Billing Data Log(4.5.3.2)*.

4.4.3.13   Set Tariff

A Command to accept new values for *Tariff Type(4.5.2.22)*, *Tariff TOU Price Matrix(4.5.2.21)*, *Tariff Block Price Matrix(4.5.2.18)*, *Tariff Switching Table(4.5.2.19)*, and *Tariff Threshold Matrix(4.5.2.20)*.

In executing the Command, the GSMS shall be capable of recording:

  i.   the *Tariff TOU Register Matrix(4.5.3.13)*;
  ii.   the *Tariff Block Counter Matrix(4.5.3.12)*;
  iii. the *Meter Balance(4.5.3.6)*;
  iv.   the *Emergency Credit Balance(4.5.3.4)*;
  v.   the *Payment Debt Register(4.5.3.8)*;
  vi.   the *Time Debt Registers [1 … 2](4.5.3.14)*; and
  vii. the *Accumulated Debt Register(4.5.3.1)*,

in the *Billing Data Log(4.5.3.2)*.

4.4.3.14   Synchronise Clock

A Command to synchronise the Clock with UTC over its WAN Interface.

4.4.3.15   Update Firmware

A Command to receive new Firmware.

In executing the Command, the GSMS shall be capable of:

  i.   only accepting new Firmware from an Authorised and Authenticated source;
  ii.   verifying the Authenticity and Integrity of new Firmware before installation; and
  iii. installing new Firmware using a mechanism that is robust against failure and loss of data.

The new Firmware shall include version information which the GSMS shall be capable of being made available to be read from *Firmware Version*(*4.5.1.2*).

4.4.3.16   Update Security Credentials

A Command to update or revoke Security Credentials held within the GSMS.

4.4.3.17   Write Configuration Data

A Command to record one or more new values of the configuration data items set out in §*4.5.2*.

In executing the Command, the GSMS shall be capable of logging all changes of values in the *Event Log*(*4.5.3.5*).

4.5 Data requirements

This section describes the minimum information which a GSMS is to be capable of holding in its Data Store.

4.5.1 Constant data

Describes data that remains constant and unchangeable other than through Firmware upgrades.

4.5.1.1 Device Identifier

An identifier used to uniquely identify each Device installed to comply with the smart metering roll-out licence conditions.

4.5.1.2 Firmware Version

The operational version of Firmware of the GSMS.

4.5.2 Configuration data

Describes data that configures the operation of various functions of a GSMS.

4.5.2.1 Billing Calendar

A calendar defining billing dates for the storage of billing related information in the *Billing Data Log*(*4.5.3.2*).

4.5.2.2 Calorific Value

The value used in the conversion of gas volume to kWh usage, based on the energy stored in one cubic metre of gas released when burnt at a standard temperature and pressure.

4.5.2.3 Conversion Factor

The value used in the conversion of gas volume to kWh usage, based on the temperature, pressure and compressibility conditions the gas is subjected to.

4.5.2.4 Debt Recovery per Payment

The percentage of a payment to be recovered against debt when the GSMS is operating Payment-based Debt Recovery in Prepayment Mode.

4.5.2.5 Debt Recovery Rates [1 … 2]

Two debt recovery rates in Currency Units per unit time for when the GSMS is using Time-based Debt Recovery in Prepayment Mode.

4.5.2.6 Debt Recovery Rate Cap

The maximum amount in Currency Units per unit time that can be recovered through Payment-based Debt Recovery when the GSMS is operating in Prepayment Mode.

4.5.2.7 Disablement Threshold

The threshold in Currency Units for controlling when to Disable the Supply.

4.5.2.8 Emergency Credit Limit

The amount of Emergency Credit in Currency Units to be made available to a Consumer when Emergency Credit is activated by the Consumer.

4.5.2.9 Emergency Credit Threshold

The threshold in Currency Units below which *Emergency Credit Balance*(*4.5.3.4*) may be activated by the Consumer if so configured when the GSMS is operating in Prepayment Mode.

4.5.2.10   Low Credit Threshold

The threshold in Currency Units below which a low credit Alert is signalled.

4.5.2.11   Non-Disablement Calendar

A calendar defining times, days and dates that specify periods during which the Supply will not be Disabled when the meter is operating in Prepayment Mode.

4.5.2.12   Payment Mode

The current mode of operation, being Prepayment Mode or Credit Mode.

4.5.2.13   Standing Charge

A charge to be levied in Currency Units per unit time when operating in Credit Mode and Prepayment Mode.

4.5.2.14   Supply Depletion State

A setting to control the state of the Supply in the case of loss of power to the GSMS, being Disabled or unchanged.

4.5.2.15   Supply Tamper State

A setting to control the state of the Supply in the case of a Tamper Event being detected, being Disabled or unchanged.

4.5.2.16   Suspend Debt Disabled

A setting controlling whether debt should be collected when the GSMS is operating in Prepayment Mode and Supply is Disabled.

4.5.2.17 Suspend Debt Emergency

A setting controlling whether debt should be collected when the GSMS is operating in Prepayment Mode and the *Emergency Credit Balance*(*4.5.3.4*) is below the *Emergency Credit Limit*(*4.5.2.8*).

4.5.2.18 Tariff Block Price Matrix

A 4 x 1 matrix containing Prices for Block Pricing.

4.5.2.19 Tariff Switching Table

A set of rules for allocating daily Consumption to a Tariff Register for Time-of-use Pricing and Time-of-use with Block Pricing. The rules stored within the table shall support at least 50 Time-of-use switching rules per annum.

The rules shall support allocation based on:

i. day, days and day ranges; and
ii. date, dates and date ranges.

All dates shall be specified as UTC.

4.5.2.20 Tariff Threshold Matrix

A 3 x 1 matrix capable of holding thresholds in kWh for controlling Block Tariffs.

4.5.2.21 Tariff TOU Price Matrix

A 1 x 4 matrix containing Prices for Time-of-use Pricing.

4.5.2.22 Tariff Type

The Tariff type in operation, being Time-of-use or Time-of-use with Block.

4.5.2.23 Uncontrolled Gas Flow Rate

The flow rate in units of volume per unit time used in the detection of uncontrolled flow of gas on Enablement of Supply.

4.5.3 Operational data

Describes data used by the functions of a GSMS for output of information.

4.5.3.1 Accumulated Debt Register

The debt resulting from the collection of *Standing Charge*(*4.5.2.13*) and/or Time-based Debt when no credit or Emergency Credit is available, when operating in Prepayment Mode.

4.5.3.2 Billing Data Log

A log for storing the following date and time stamped entries of:

i. twelve entries comprising *Tariff TOU Register Matrix*(*4.5.3.13*) and *Tariff Block Counter Matrix*(*4.5.3.12*);
ii. five entries comprising prepayment credits;
iii. ten entries comprising time-based debt payments;
iv. ten entries comprising payment-based debt payments; and

v. twelve entries comprising *Meter Balance*(*4.5.3.6*), *Emergency Credit Balance*(*4.5.3.4*), *Accumulated Debt Register*(*4.5.3.1*), *Payment Debt Register*(*4.5.3.8*) and *Time Debt Registers [1 … 2]*(*4.5.3.14*),

arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

4.5.3.3 Daily Read Log

A log for storing fourteen date and time stamped entries of the *Tariff TOU Register Matrix*(*4.5.3.13*), the *Tariff Block Counter Matrix*(*4.5.3.12*) and the *Total Consumption Register*(*4.5.3.15*) arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

4.5.3.4 Emergency Credit Balance

The amount of Emergency Credit available to the Consumer after it has been activated by the Consumer.

4.5.3.5 Event Log

A log for storing one hundred UTC date and time stamped entries of non-security related information for diagnosis and auditing, arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

4.5.3.6 Meter Balance

The amount of money in Currency Units as determined by the GSMS. If operating in Prepayment Mode, the Meter Balance represents the GSMS's determination of the amount of credit available to the Consumer (excluding any *Emergency Credit Balance(4.5.3.4)*). If operating in Credit Mode, it represents the GSMS's determination of the amount of money due from the Consumer since the Meter Balance was last reset.

4.5.3.7 Network Data Log

A log for storing four hours of date and time stamped six minute Consumption data.

4.5.3.8 Payment Debt Register

Debt to be recovered as a percentage of payment when using Payment-based Debt Recovery in Prepayment Mode.

4.5.3.9 Profile Data Log

A log for storing a minimum of thirteen months of date and time stamped half hourly Consumption data arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

4.5.3.10 Remaining Battery Capacity

Where a GSMS includes a Battery, the remaining Battery capacity in days.

4.5.3.11 Security Log

A log for storing one hundred UTC date and time stamped entries of security related information for diagnosis and auditing arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

4.5.3.12 Tariff Block Counter Matrix

A 4 x 1 matrix for storing Block Counters for Block Pricing.

4.5.3.13 Tariff TOU Register Matrix

A 1 x 4 matrix for storing Tariff Registers for Time-of-use Pricing.

4.5.3.14 Time Debt Registers [1 … 2]

Two registers recording independent debts to be recovered over time when operating Time-based Debt Recovery in Prepayment Mode.

4.5.3.15 Total Consumption Register

The register recording cumulative total Consumption.

4.5.3.16 Valve State

The state of the Valve, being opened, closed or Armed.

5 Electricity Smart Metering System Technical Specification

5.1 Overview

This section sets out the minimum physical requirements, minimum functional requirements, minimum interface requirements and minimum data requirements of an Electricity Smart Metering System (ESMS) installed to comply with the smart metering roll-out licence conditions (standard licence condition 39 of electricity supply licences).

For the avoidance of doubt, an ESMS may comprise one or more Devices provided that together they meet the minimum requirements of this section.

5.2 Physical requirements

An ESMS shall as a minimum include the following components:

   i.   a Clock;
   ii.   a Data Store;
   iii.   an Electricity Meter;
   iv.   a HAN Interface;
   v.   a Load Switch;
   vi.   a User Interface; and
   vii.   a WAN Interface.

An ESMS shall be mains powered and be capable of operating at a nominal voltage of 230VAC and consuming no more than an average of 4 watts of electricity under normal operating conditions.

An ESMS shall be capable of automatically resuming operation after a power failure in its operating state prior to such failure.

Each Device forming part of the ESMS shall:

viii.   display the *Device Identifier(5.5.1.1)*; and
   ix.   have a Secure Perimeter.

The WAN Interface of an ESMS shall:

   x.   be capable of being replaced without also requiring the replacement of the Electricity Meter; and
   xi.   support communications based on Open Standards.

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The HAN Interface of an ESMS shall be capable of supporting communications based on Open Standards.

5.3 Functional requirements

This section sets out the minimum functions that an ESMS shall be capable of performing.

5.3.1 Clock

The Clock forming part of an ESMS shall be capable of operating so as to be accurate to within 10 seconds of UTC under normal operating conditions.

5.3.2 Communications

An ESMS shall be capable of establishing Communications Links via each of its interfaces (including its HAN Interface and its WAN Interface).

An ESMS, and any Device forming part of it, shall be capable of ensuring that the security characteristics of all Communications Links it establishes meet the requirements set-out in §*5.3.9.3*.

For all Commands received via any Communications Link the ESMS shall be capable of:

i.   Authenticating to a Trusted Source the Command and on failure to so Authenticate, generating an entry in the *Security Log*(*5.5.3.16*) to that effect and discarding the Command without execution and without sending a Response;
ii.   verifying that it is the intended recipient of the Command and if it is not the intended recipient, generating an entry in the *Security Log*(*5.5.3.16*) to that effect and discarding the Command without execution and without sending a Response;
iii. verifying the validity of the contents and format of the Command and if invalid, sending a Response to that effect via its WAN Interface; and
iv.   on detection of Unauthorised access of the nature described in §*5.3.9*, discarding the Command without execution and without sending a Response.

5.3.2.1 Communications with Consumer Devices over the HAN Interface

An ESMS shall be capable of establishing a Communications Link via its HAN Interface with at least one Consumer Device that is capable of providing the Consumer with access to the information set-out in §*5.4.1*.

In establishing the Communications Link, the ESMS shall be capable of receiving Security Credentials to enable it to Authenticate the Consumer Device.

Where it has established a Communications Link with a Consumer Device the ESMS shall be capable of:

i.   sending information (set-out in §*5.4.1*) to the Consumer Device; and
ii.   sending Alerts to the Consumer Device.

5.3.2.2 Communications with Microgeneration Meters over the HAN Interface

An ESMS shall be capable of establishing a Communications Link via its HAN Interface with at least one Microgeneration Meter.

In establishing the Communications Link, the ESMS shall be capable of identifying and Authenticating the Microgeneration Meter with which it has established a Communication Link.

Where it has established a Communications Link with a Microgeneration Meter the ESMS shall be capable of:

i.   sending requests for the information (set-out in §*5.4.2*) to the Microgeneration Meter; and

ii.   receiving the information (set-out in §*5.4.2*) from the Microgeneration Meter.

5.3.2.3 Communications with a HES over the WAN Interface

An ESMS shall be capable of establishing a Communications Link via its WAN Interface with a HES.

In establishing the Communications Link, the ESMS shall be capable of exchanging Security Credentials to enable mutual Authentication with the HES.

Where it has established a Communications Link with a HES the ESMS shall be capable of:

i.   receiving the Commands (set-out in §*5.4.4*) from the HES;
ii.   sending the Responses (set-out in §*5.4.4*) to the HES; and
iii.   sending Alerts to the HES.

5.3.3 Data storage

An ESMS shall be capable of retaining all information held in its Data Store on loss of power.

5.3.4 Display of information

An ESMS shall be capable of displaying the following up to date information on its User Interface:

i.   the *Payment Mode*(*5.5.2.17*) currently in operation, being Prepayment Mode or Credit Mode;
ii.   the *Tariff TOU Register Matrix*(*5.5.3.18*) and the *Tariff Block Counter Matrix*(*5.5.3.17*);
iii.   the *Meter Balance*(*5.5.3.13*);
iv.   whether Emergency Credit is available for activation;
v.   whether the ESMS has suspended the disablement of Supply during a period defined in the *Non-Disablement Calendar*(*5.5.2.16*) *(*as set-out in §*5.3.6.2*);
vi.   the *Emergency Credit Balance*(*5.5.3.9*) when Emergency Credit is activated;
vii.   any low credit condition;
viii.   the Supply status, being Enabled or Disabled;
ix.   any Time-based Debts and Time-based Debt Recovery rates;
x.   any Payment-based Debt;
xi.   any accumulated debt recorded in the *Accumulated Debt Register*(*5.5.3.1*); and
xii.   any *Standing Charge*(*5.5.2.26*).

An ESMS shall be capable of displaying Currency Units in GB Pounds and European Central Bank Euro.

5.3.5 Monitoring

5.3.5.1 Load limiting

An ESMS shall be capable of determining when the Active Power Import(*5.5.3.2*) exceeds, for a continuous period of thirty seconds or more, the *Load Limit Power Threshold*(*5.5.2.11*) and on such an occurrence the ESMS shall be capable of:

i. generating an entry to that effect in the *Event Log*(*5.5.3.10*);
ii. counting the number of such occurrences in the *Load Limit Counter*(*5.5.3.11*);
iii. sending an Alert to that effect via its WAN Interface and its User Interface;
iv. Disabling the Supply in circumstances where the *Load Limit Supply State*(*5.5.2.12*) is configured to require Disablement and then immediately Arming the Load Switch and displaying any such change in state of the Load Switch on its User Interface; and
v. notifying the change in state via its HAN Interface and WAN Interface.

5.3.6 Payment Mode

An ESMS shall be capable of operating in Credit Mode and Prepayment Mode and of being remotely switched from one mode to the other.

5.3.6.1 Credit Mode

An ESMS when operating in Credit Mode shall be capable of maintaining a calculation of the *Meter Balance*(*5.5.3.13*) based on:

i. the Consumption in the *Tariff TOU Register Matrix*(*5.5.3.18*) multiplied by the Prices in the *Tariff TOU Price Matrix*(*5.5.2.33*) and, if operating Time-of-use with Block Pricing, additionally the Consumption in the *Tariff Block Counter Matrix*(*5.5.3.17*) multiplied by the Prices in the *Tariff Block Price Matrix*(*5.5.2.30*); and
ii. the *Standing Charge*(*5.5.2.26*),

and of displaying the *Meter Balance*(*5.5.3.13*) on its User Interface.

5.3.6.2 Prepayment Mode

An ESMS shall be capable of operating in Prepayment Mode, including during periods of loss of its Communications Link via its WAN Interface, and maintaining a balance of credit and reflecting any reduction in credit based on Consumption, standing charge and Time-based Debt Recovery.

An ESMS shall be capable of adding credit to the *Meter Balance*(*5.5.3.13*) (as set out in §*5.4.3.2* and §*5.4.4.2*) and reducing the amount of credit in the *Meter Balance*(*5.5.3.13*).

An ESMS shall be capable of making Emergency Credit available to the Consumer (by means of the *Emergency Credit Balance*(*5.5.3.9*)) if the *Meter Balance*(*5.5.3.13*) is below the *Emergency Credit Threshold*(*5.5.2.10*). The ESMS shall be capable of displaying the availability of Emergency Credit on its User Interface. The amount of Emergency Credit made available to the Consumer shall be equal to the *Emergency Credit Limit*(*5.5.2.9*). An ESMS shall be capable of reducing the amount of credit in the *Emergency Credit Balance*(*5.5.3.9*) in the case where Emergency Credit is activated by

the Consumer (as set out in §*5.4.3.1* and §*5.4.4.1*) and the *Meter Balance*(*5.5.3.13*) is exhausted. Any Emergency Credit used shall be repaid when credit is added to the ESMS (as set out in §*5.4.3.1* and §*5.4.4.1*).

An ESMS shall be capable of reducing the *Meter Balance*(*5.5.3.13*) until exhausted followed by reducing the *Emergency Credit Balance*(*5.5.3.9*), if activated, until exhausted on the basis of:

i.   the Consumption in the *Tariff TOU Register Matrix*(*5.5.3.18*) multiplied by the Prices in the *Tariff TOU Price Matrix*(*5.5.2.33*) and, if operating Time-of-use with Block Pricing, additionally the Consumption in the *Tariff Block Counter Matrix*(*5.5.3.17*) multiplied by the Prices in the *Tariff Block Price Matrix*(*5.5.2.30*);

ii.   the *Standing Charge*(*5.5.2.26*); and

iii.   the recovery of debt through each of the *Time Debt Registers [1 … 2]*(*5.5.3.19*) at rates by the *Debt Recovery Rates [1 … 2]*(*5.5.2.6*),

and the ESMS shall be capable of recording debt recovered in the *Billing Data Log*(*5.5.3.7*).

An ESMS shall be capable of monitoring the *Meter Balance*(*5.5.3.13*) and the activated *Emergency Credit Balance*(*5.5.3.9*) and:

iv.   if the combined credit of the *Meter Balance*(*5.5.3.13*) and *Emergency Credit Balance*(*5.5.3.9*) falls below the *Low Credit Threshold*(*5.5.2.13*), displaying an Alert to that effect on its User Interface, and sending an Alert to that effect via its HAN Interface and WAN Interface;

v.   if the combined credit of the *Meter Balance*(*5.5.3.13*) and *Emergency Credit Balance*(*5.5.3.9*) falls below the *Disablement Threshold*(*5.5.2.8*), Disabling the Supply, displaying an Alert to that effect on its User Interface and sending an Alert to that effect via its HAN Interface and WAN Interface; and

vi.   suspending the Disablement of Supply during periods defined in the *Non-Disablement Calendar*(*5.5.2.16*), and displaying an indication that the Disablement of Supply has been suspended on its User Interface.

An ESMS shall be capable of controlling recovery of debt in cases where Emergency Credit is in use or the Supply is Disabled by:

vii.   suspending debt recovery when Emergency Credit is in use if configured by *Suspend Debt Emergency*(*5.5.2.29*) to do so; and

viii.   suspending debt recovery when the Supply is Disabled if configured by *Suspend Debt Disabled*(*5.5.2.28*) to do so.

In circumstances where the Supply is Disabled, the ESMS shall be capable of continuing to recover Time-based Debt (if so configured as set out in *viii* above) and *Standing Charge*(*5.5.2.26*), and recording the debt recovered in the *Accumulated Debt Register*(*5.5.3.1*).

5.3.7 Pricing

An ESMS shall be capable of applying Time-of-use Pricing and Time-of-use with Block Pricing, as configured by *Tariff Type*(*5.5.2.34*).

5.3.7.1 Time-of-use Pricing

An ESMS shall be capable of recording Consumption according to Time-of-use Bands in one of forty eight Tariff Registers in the *Tariff TOU Register Matrix*(*5.5.3.18*).

An ESMS shall be capable of switching between different Tariff Registers once per half hour. The switching between Time-of-use Bands and thus Tariff Registers shall be based on time of Consumption and switching rules defined in the *Tariff Switching Table*(*5.5.2.31*).

5.3.7.2 Time-of-use with Block Pricing

An ESMS shall be capable of recording Consumption according to Time-of-use Bands in one of eight Tariff Registers in the *Tariff TOU Register Matrix*(*5.5.3.18*).

An ESMS shall also be capable of accumulating Consumption in one of four Block Counters in the *Tariff Block Counter Matrix*(*5.5.3.17*) for each of the eight Time-of-use Bands. The ESMS shall be capable of switching between Block Counters according to the Consumption thresholds in the *Tariff Threshold Matrix*(*5.5.2.32*).

An ESMS shall be capable of switching between different Tariff Registers once per half hour. The switching between Time-of-use Bands and thus Tariff Registers shall be based on time of Consumption and switching rules set out in the *Tariff Switching Table*(*5.5.2.31*).

5.3.8 Recording

5.3.8.1 Billing data

An ESMS shall be capable of taking a date and time stamped copy of and storing the *Tariff TOU Register Matrix*(*5.5.3.18*) and the *Tariff Block Counter Matrix*(*5.5.3.17*) in the *Billing Data Log*(*5.5.3.7*) in accordance with the timetable set out in the *Billing Calendar*(*5.5.2.4*) and then immediately resetting the Block Counters in the *Tariff Block Counter Matrix*(*5.5.3.17*) and if operating in Credit Mode immediately resetting the *Meter Balance*(*5.5.3.13*).

5.3.8.2 Daily read data

An ESMS shall be capable of taking a copy of and storing the *Tariff TOU Register Matrix*(*5.5.3.18*), the *Tariff Block Counter Matrix*(*5.5.3.17*) and the *Total Active Import Register*(*5.5.3.21*) together with a date and time stamp in the *Daily Read Log*(*5.5.3.8*) every day at midnight UTC.

5.3.8.3 Half hour profile data

In each thirty minute period (commencing at the start of minutes 00 and 30 in each hour), an ESMS shall be capable of recording the following (including details of the thirty minute period to which the data relates) in the *Profile Data Log*(*5.5.3.15*):

i.   Active Energy Imported (Consumption);
ii.   Active Energy Exported;
iii. Reactive Energy Imported; and
iv.   Reactive Energy Exported.

5.3.8.4 Power threshold status

An ESMS shall be capable of comparing the *Active Power Import*(*5.5.3.2*) against thresholds and recording an indication of the level of consumption as follows:

i.   if the *Active Power Import*(*5.5.3.2*) is equal to or lower than the *Low Medium Power Threshold*(*5.5.2.14*), set *Ambient Power*(*5.5.3.3*) to low;

ii.   if the *Active Power Import*(*5.5.3.2*) is higher than the *Low Medium Power Threshold*(*5.5.2.14*) and equal to or lower than the *Medium High Power Threshold*(*5.5.2.15*), set *Ambient Power*(*5.5.3.3*) to medium; or

iii. otherwise, set the *Ambient Power*(*5.5.3.3*) to high.

5.3.8.5 Total Active Energy Imported

An ESMS shall be capable of recording cumulative Active Energy Imported in the *Total Active Import Register*(*5.5.3.21*).

5.3.8.6 Total Active Energy Exported

An ESMS shall be capable of recording cumulative Active Energy Exported in the *Total Active Export Register*(*5.5.3.20*).

5.3.8.7 Total Reactive Energy Imported

An ESMS shall be capable of recording cumulative Reactive Energy Imported in the *Total Reactive Import Register*(*5.5.3.23*).

5.3.8.8 Total Reactive Energy Exported

An ESMS shall be capable of recording cumulative Reactive Energy Exported in the *Total Reactive Export Register*(*5.5.3.22*).

5.3.9 Security

5.3.9.1 General

An ESMS shall be designed taking all reasonable steps so as to ensure that any failure or compromise of its Integrity shall not compromise the Security Credentials or Personal Data stored on it or compromise the Integrity of any other Device to which it is connected by means of a Communications Link.

An ESMS shall be capable of verifying the Integrity of its Firmware at power-on and prior to execution.

An ESMS shall be capable of logging in the *Security Log*(*5.5.3.16*) information on all Sensitive Events.

5.3.9.2 Physical

An ESMS shall be designed taking all reasonable steps so as to prevent Unauthorised Physical Access through its Secure Perimeter that could compromise the Confidentiality and/or Data Integrity of:

i.   Personal Data;
ii.   Security Credentials;
iii. Random Number Generator;
iv.   Cryptographic Algorithms;

v.   the Electricity Meter; and

vi. Firmware and data essential for ensuring its Integrity,

held or executing on the ESMS.

An ESMS shall be capable of detecting any attempt at Unauthorised Physical Access through its Secure Perimeter that could compromise such Confidentiality and/or Data Integrity and on such detection shall be capable of:

xi. providing evidence of such an attempt through the use of tamper evident coatings or seals;

and where reasonably practicable:

viii. generating an entry to that effect in the *Security Log(5.5.3.16)*;

ix. sending an Alert to that effect via its WAN Interface; and

x.   Disabling the Supply, in circumstances where the *Supply Tamper State(5.5.2.27)* is configured to require Disablement.

5.3.9.3 Communications

An ESMS shall be capable of preventing and detecting, on all of its interfaces, Unauthorised access that could compromise the Confidentiality and/or Data Integrity of:

i.   Personal Data whilst being transferred via an interface;

ii. Security Credentials whilst being transferred via an interface;

iii. Firmware and data essential for ensuring its Integrity whilst being transferred via an interface;

and any Command that could compromise the Confidentiality and/or Data Integrity of:

iv. Personal Data;

v.   Security Credentials; and

vi. Firmware and data essential for ensuring its Integrity,

held or executing on the ESMS, and on such detection shall be capable of:

vii. generating an entry to that effect in the *Security Log(5.5.3.16)*; and

viii. sending an Alert to that effect via its WAN Interface.

An ESMS shall be capable of employing techniques to protect against Replay Attacks of information used to Authenticate the identity of a system or individual.

An ESMS shall not be capable of modifying entries from, or executing a Command to modify or delete entries from the *Security Log(5.5.3.16)*.

5.3.10   Voltage quality measurements

5.3.10.1   Average RMS voltage

An ESMS shall be capable of calculating the average value of RMS voltage over a configurable period as defined in the *Average RMS Voltage Measurement Period*(*5.5.2.3*), and:

i.   recording the value so calculated (including details of the period to which the value relates) in the *Average RMS Voltage Profile Data Log*(*5.5.3.4*).

ii.   detecting when the value so calculated is above the *Average RMS Over Voltage Threshold*(*5.5.2.1*), and on detection:

a   generating an entry to that effect in the *Event Log(5.5.3.10)*;

b   counting the number of such occurrences in the *Average RMS Over Voltage Counter*(*5.5.3.4*); and

c   sending an Alert to that effect via its WAN Interface.

iii.   detecting when the value so calculated is below the *Average RMS Under Voltage Threshold*(*5.5.2.2*), and on detection:

a   generating an entry to that effect in the *Event Log(5.5.3.10)*;

b   counting the number of such occurrences in the *Average RMS Under Voltage Counter*(*5.5.3.5*); and

c   sending an Alert to that effect via its WAN Interface.

5.3.10.2   RMS extreme over voltage detection

An ESMS shall be capable of detecting when the RMS voltage is above the *RMS Extreme Over Voltage Threshold*(*5.5.2.20*) for longer than the continuous period defined in the *RMS Extreme Over Voltage Measurement Period(5.5.2.18)*, and on detection:

i.   generating an entry to that effect in the *Event Log*(*5.5.3.10*); and

ii.   sending an Alert to that effect via its WAN Interface.

5.3.10.3   RMS extreme under voltage detection

An ESMS shall be capable of detecting when the RMS voltage is below the *RMS Extreme Under Voltage Threshold*(*5.5.2.21*) for longer than the continuous period defined in the *RMS Extreme Under Voltage Measurement Period(5.5.2.19)*, and on detection:

i.   generating an entry to that effect in the *Event Log*(*5.5.3.10*); and

ii.   sending an Alert to that effect via its WAN Interface.

5.3.10.4   RMS voltage sag detection

An ESMS shall be capable of detecting when the RMS voltage is below the *RMS Voltage Sag Threshold(5.5.2.24)* for longer than the continuous period defined in the *RMS Voltage Sag Measurement Period(5.5.2.22)*, and on detection:

i.   generating an entry to that effect in the *Event Log*(*5.5.3.10*); and

ii.   sending an Alert to that effect via its WAN Interface.

5.3.10.5   RMS voltage swell detection

An ESMS shall be capable of detecting when the RMS voltage is above the *RMS Voltage Swell Threshold(5.5.2.25)* for longer than the continuous period defined in the *RMS Voltage Swell Measurement Period*(*5.5.2.23*), and on detection:

i.   generating an entry to that effect in the *Event Log*(*5.5.3.10*); and

ii.   sending an Alert to that effect via its WAN Interface.

5.3.10.6   Supply outage detection

An ESMS shall be capable of generating entries in the *Event Log*(*5.5.3.10*) recording each occasion when the Supply is interrupted and/or restored.

5.4 Interface requirements

This section sets out the minimum required interactions which an ESMS shall be capable of undertaking with Consumer Devices and a HES via its interfaces.

5.4.1 HAN Interface Consumer Device information provision

An ESMS shall be capable, immediately upon establishment of a Communications Link with a Consumer Device (as set out in §*5.3.2.1*), of providing the following information (with updates of any changes to the instantaneous Active Power measurement every 10 seconds thereafter, and timely updates of any changes to the other information) to that Consumer Device:

    i.   the *Meter Balance*(*5.5.3.13*);
    ii.   the date and time of the last update of the *Meter Balance*(*5.5.3.13*);
    iii.   the Clock time in UTC;
    iv.   the *Total Active Import Register*(*5.5.3.21*);
    v.   the *Tariff TOU Register Matrix*(*5.5.3.18*) and *Tariff Block Counter Matrix*(*5.5.3.17*);
    vi.   the *Tariff Switching Table*(*5.5.2.31*);
    vii.   the *Daily Read Log(5.5.3.8*);
    viii.   the *Emergency Credit Balance*(*5.5.3.9*) if Emergency Credit is activated;
    ix.   the *Tariff TOU Price Matrix*(*5.5.2.33*) and *Tariff Block Price Matrix*(*5.5.2.30*) with an indication of the active Tariff Price;
    x.   the Time-based Debts from the *Time Debt Registers [1 … 2]*(*5.5.3.19*);
    xi.   the Time-based Debt Recovery rates from the *Debt Recovery Rates [1 … 2]*(*5.5.2.6*);
    xii.   the Payment-based Debt from the *Payment Debt Register(5.5.3.14)*;
    xiii.   the accumulated debt from the *Accumulated Debt Register*(*5.5.3.1*)*;*
    xiv.   the *Low Medium Power Threshold*(*5.5.2.14*) and *Medium High Power Threshold*(*5.5.2.15*);
    xv.   the instantaneous Active Power measurement;
    xvi.   the *Low Credit Threshold*(*5.5.2.13*);
    xvii.   the *Profile Data Log*(*5.5.3.15*)*; and*
    xviii.   the *Payment Mode(5.5.2.17)*.

5.4.2 HAN Interface Microgeneration Meter information forwarding

An ESMS shall be capable, upon establishment of a Communications Link with a Microgeneration Meter (as set out in §*5.3.2.2*), of:

    i.   receiving requests for information from the HES via its WAN Interface and forwarding such requests for information to the Microgeneration Meter via its HAN Interface; and
    ii.   sending information received from a Microgeneration Meter via its HAN Interface and forwarding such information to the HES via its WAN Interface.

5.4.3 User Interface Commands

An ESMS shall be capable of executing immediately the Commands set out in this section (§*5.4.3*) following their receipt via its User Interface.

The ESMS shall be capable of logging all such Commands received and Outcomes in the *Event Log*(*5.5.3.10*).

5.4.3.1 Activate Emergency Credit

A Command to activate Emergency Credit (when the ESMS is operating in Prepayment Mode) if Emergency Credit is available (as set-out in §*5.3.6.2*).

In executing the Command, if the Supply is Disabled, the ESMS shall be capable of Arming the Load Switch and Enabling the Supply.

5.4.3.2 Add Credit

A Command to add credit to the ESMS (when the ESMS is operating in Prepayment Mode) on input of a UTRN. In executing the Command, the ESMS shall be capable of:

- i.   verifying the Authenticity of the UTRN;
- ii. verifying that the ESMS is the intended recipient of the UTRN;
- iii. rejecting duplicate presentation of the same UTRN; and
- iv. controlling the number of invalid UTRN entries processed.

The ESMS shall be capable, on failure of any of *i* to *iv* above, of generating an entry in the *Security Log(5.5.3.17)* to that effect.

In executing the Command, the ESMS shall be capable of applying the credit added in the following order:

- v.   recovery of Payment-based Debt of an amount defined by *Debt Recovery per Payment*(*5.5.2.5*) from the *Payment Debt Register(5.5.3.14)* subject to the *Debt Recovery Rate Cap*(*5.5.2.7*);
- vi.   recovery of debt accumulated in the *Accumulated Debt Register*(*5.5.3.1*);
- vii. repayment of Emergency Credit activated and used by Consumer; and
- viii. adding remaining credit (the credit after deduction of *v, vi* and *vii* above) to the *Meter Balance*(*5.5.3.13*).

In executing the Command, the ESMS shall be capable of Arming the Load Switch if the *Meter Balance*(*5.5.3.13*) rises above the *Disablement Threshold*(*5.5.2.8*) and displaying any such change in state of the Load Switch on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

In executing the Command, the ESMS shall be capable of recording the credit added to the *Meter Balance*(*5.5.3.13*) in the *Billing Data Log*(*5.5.3.7*).

5.4.3.3 Enable Supply

A Command to enable the Supply if the Load Switch is Armed.

5.4.4 WAN Interface Commands

An ESMS shall be capable of executing the Commands set out in this section (§*5.4.4*).

An ESMS shall be capable of executing Commands immediately on receipt ("immediate Commands"). An ESMS shall be capable of executing certain Commands at a future date ("future dated Commands"). A future dated Command shall include a date and time at which the Command shall be executed by the ESMS.

An ESMS shall be capable of sending a Response containing the Outcome on execution of an immediate Command.

An ESMS shall be capable of sending a Response acknowledging receipt of a future dated Command immediately upon its receipt. An ESMS shall be capable of sending a Response containing the Outcome at the future date and time of execution of a future dated Command.

An ESMS shall be capable of over-writing an outstanding future dated Command on receipt of a new future dated Command of the same type. A future dated Command shall be capable of being cancelled by an Authorised party. An ESMS shall be capable of cancelling a future dated Command upon receipt of an immediate Command of the same type. An ESMS shall be capable of sending an Outcome including the reason for failure of a future dated Command in the event that it has been over-written or cancelled.

An ESMS shall be capable of logging all such Commands received and Outcomes in the *Event Log*(*5.5.3.10*).

5.4.4.1 Activate Emergency Credit

A Command to activate Emergency Credit (when the ESMS is operating in Prepayment Mode) if Emergency Credit is available (as set-out in §*5.3.6.2*).

In executing the Command, if the Supply is Disabled, the ESMS shall be capable of Arming the Load Switch.

5.4.4.2 Add Credit

A Command to accept credit to be applied to the ESMS (when the ESMS is operating in Prepayment Mode). In executing the Command, the ESMS shall be capable of applying the credit added in the following order:

i. recovery of Payment-based Debt of an amount defined by *Debt Recovery per Payment*(*5.5.2.5*) from the *Payment Debt Register*(*5.5.3.14)* subject to the *Debt Recovery Rate Cap*(*5.5.2.7*);
ii. recovery of debt accumulated in the *Accumulated Debt Register*(*5.5.3.1*);
iii. repayment of Emergency Credit activated and used by Consumer; and
iv. adding remaining credit (the credit after deduction of **i**, *ii* and iii above) to the *Meter Balance*(*5.5.3.13*).

In executing the Command, the ESMS shall be capable of Arming the Load Switch if the *Meter Balance*(*5.5.3.13*) rises above the *Disablement Threshold*(*5.5.2.8*) and displaying any such change in state of the Load Switch on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

In executing the Command, the ESMS shall be capable of recording the credit added to the *Meter Balance*(*5.5.3.13*) in the *Billing Data Log*(*5.5.3.7*).

5.4.4.3 Adjust Debt

A Command to apply positive and negative adjustments to the *Time Debt Registers [1 … 2]*(*5.5.3.19*) and the *Payment Debt Register(5.5.3.14)* (when operating in Prepayment Mode).

5.4.4.4 Adjust Meter Balance

A Command to apply positive and negative adjustments to the *Meter Balance*(*5.5.3.13*).

If the ESMS is operating in Prepayment Mode and, following such adjustment, if the *Meter Balance*(*5.5.3.13*) rises above the *Disablement Threshold*(*5.5.2.8*), the ESMS shall be capable of Arming the Load Switch and displaying any such change in state of the Load Switch on its User Interface and notifying the change in state via its HAN Interface and WAN Interface.

5.4.4.5 Arm Load Switch

A Command to Arm the Load Switch.

5.4.4.6 Clear Event Log

A Command to clear all entries from the *Event Log*(*5.5.3.10*).

5.4.4.7 Disable Supply

A Command to Disable the Supply.

5.4.4.8 Enable Supply

A Command to Enable the Supply without the need for local physical interaction.

5.4.4.9 Read Configuration Data

A Command to read the value of one or more of the configuration data items set out in §*5.5.2*.

In executing the Command, the ESMS shall be capable of sending such value(s) in a Response via its WAN Interface.

5.4.4.10   Read Constant Data

A Command to read the value of one or more of the constant data items set out in §*5.5.1*.

In executing the Command, the ESMS shall be capable of sending such value(s) in a Response via its WAN Interface.

5.4.4.11   Read Operational Data

A Command to read the value of one or more of the operational data items set out in §*5.5.3*.

In executing the Command, the ESMS shall be capable of sending such value(s) in a Response via its WAN Interface.

5.4.4.12　Reset Load Limit Counter

A Command to reset the *Load Limit Counter*(*5.5.3.11*) to zero.

5.4.4.13　Reset Average RMS Over Voltage Counter

A Command to reset the *Average RMS Over Voltage Counter*(*5.5.3.4*) to zero.

5.4.4.14　Reset Average RMS Under Voltage Counter

A Command to reset the *Average RMS Under Voltage Counter*(*5.5.3.5*) to zero.

5.4.4.15　Restrict Data

A Command to mark configuration and/or operational data as restricted so as to prevent from disclosure on its HAN Interface and its User Interface.

5.4.4.16　Set Payment Mode

A Command to set the payment mode as either Prepayment Mode or Credit Mode and to record the mode of operation in *Payment Mode*(*5.5.2.17*).

In executing the Command, the ESMS shall be capable of recording:

  i.　the *Tariff TOU Register Matrix*(*5.5.3.18*);
 ii.　the *Tariff Block Counter Matrix*(*5.5.3.17*);
iii.　the *Meter Balance*(*5.5.3.13*);
 iv.　the *Emergency Credit Balance*(*5.5.3.9*);
  v.　the *Payment Debt Register(5.5.3.14)*;
 vi.　the *Time Debt Registers [1 … 2](5.5.3.19*); and
vii.　the *Accumulated Debt Register*(*5.5.3.1*),

in the *Billing Data Log*(*5.5.3.7*).

5.4.4.17　Set Tariff

A Command to accept new values for *Tariff Type*(*5.5.2.34*)*, Tariff TOU Price Matrix*(*5.5.2.33*)*, Tariff Block Price Matrix*(*5.5.2.30*), *Tariff Switching Table*(*5.5.2.31*), and *Tariff Threshold Matrix*(*5.5.2.32*).

In executing the Command, the ESMS shall be capable of recording:

  i.　the *Tariff TOU Register Matrix*(*5.5.3.18*);
 ii.　the *Tariff Block Counter Matrix*(*5.5.3.17*);
iii.　the *Meter Balance*(*5.5.3.13*);
 iv.　the *Emergency Credit Balance*(*5.5.3.9*);
  v.　the *Payment Debt Register(5.5.3.14)*;
 vi.　the *Time Debt Registers [1 … 2](5.5.3.19*); and
vii.　the *Accumulated Debt Register*(*5.5.3.1*),

in the *Billing Data Log*(*5.5.3.7*).

5.4.4.18　Synchronise Clock

A Command to synchronise the Clock with UTC over its WAN Interface.

5.4.4.19   Update Firmware

A Command to receive new Firmware.

In executing the Command, the ESMS shall be capable of:

i.   only accepting new Firmware from an Authorised and Authenticated source;
ii.   verifying the Authenticity and Integrity of new Firmware before installation; and
iii.   installing new Firmware using a mechanism that is robust against failure and loss of data.

The new Firmware shall include version information which shall be capable of being made available to be read from *Firmware Version*(*5.5.1.2*).

5.4.4.20   Update Security Credentials

A Command to update or revoke Security Credentials held within the ESMS.

5.4.4.21   Write Configuration Data

A Command to record one or more new values of the configuration data items set out in §*5.5.2*.

In executing the Command, the ESMS shall be capable of logging all changes of values in the *Event Log*(*5.5.3.10*).

5.5 Data requirements

This section describes the minimum information which an ESMS is to be capable of holding in its Data Store.

5.5.1 Constant data

Describes data that remains constant and unchangeable at all times other than through Firmware upgrades.

5.5.1.1 Device Identifier

An identifier used to uniquely identify each Device installed to comply with the smart metering roll-out licence conditions.

5.5.1.2 Firmware Version

The operational version of Firmware of the ESMS.

5.5.2 Configuration data

Describes data that configures the operation of various functions of an ESMS.

5.5.2.1 Average RMS Over Voltage Threshold

The average RMS voltage above which an over voltage condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.2 Average RMS Under Voltage Threshold

The average RMS voltage below which an under voltage condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.3 Average RMS Voltage Measurement Period

The length of time in minutes that the RMS voltage is averaged over.

5.5.2.4 Billing Calendar

A calendar defining billing dates for the storage of billing related information in the *Billing Data Log*(*5.5.3.7*).

5.5.2.5 Debt Recovery per Payment

The percentage of a payment to be recovered against debt when the ESMS is operating Payment-based Debt Recovery in Prepayment Mode.

5.5.2.6 Debt Recovery Rates [1 … 2]

Two debt recovery rates in Currency Units per unit time for when the ESMS is using Time-based Debt Recovery in Prepayment Mode.

5.5.2.7 Debt Recovery Rate Cap

The maximum amount in Currency Units per unit time that can be recovered through Payment-based Debt Recovery when the ESMS is operating in Prepayment Mode.

5.5.2.8 Disablement Threshold

The threshold in Currency Units for controlling when to Disable the Supply.

5.5.2.9 Emergency Credit Limit

The amount of Emergency Credit in Currency Units to be made available to a Consumer when Emergency Credit is activated by the Consumer.

5.5.2.10   Emergency Credit Threshold

The threshold in Currency Units below which *Emergency Credit Balance*(*5.5.3.9*) may be activated by the Consumer if so configured when the ESMS is operating in Prepayment Mode.

5.5.2.11   Load Limit Power Threshold

The Active Power threshold in kW above which a load limiting event is recorded.

5.5.2.12   Load Limit Supply State

A setting to control the state of the Supply in the case of a Load Limit Event being detected, being Disabled or unchanged.

5.5.2.13   Low Credit Threshold

The threshold in Currency Units below which a low credit Alert is signalled.

5.5.2.14   Low Medium Power Threshold

A value in kW defining the threshold between an indicative low and medium *Active Power Import*(*5.5.3.2*) level.

5.5.2.15   Medium High Power Threshold

A value in kW defining the threshold between an indicative medium and high power *Active Power Import*(*5.5.3.2*) level.

5.5.2.16   Non-Disablement Calendar

A calendar defining times, days and dates that specify periods during which the Supply will not be Disabled when the meter is operating in Prepayment Mode.

All time and dates shall be specified as UTC.

5.5.2.17   Payment Mode

The current mode of operation, being Prepayment Mode or Credit Mode.

5.5.2.18   RMS Extreme Over Voltage Measurement Period

The duration in seconds used to measure an extreme over voltage condition.

5.5.2.19   RMS Extreme Under Voltage Measurement Period

The duration in seconds used to measure an extreme under voltage condition.

5.5.2.20   RMS Extreme Over Voltage Threshold

The RMS voltage above which an extreme over voltage condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.21   RMS Extreme Under Voltage Threshold

The RMS voltage below which an extreme under voltage condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.22   RMS Voltage Sag Measurement Period

The duration in seconds used to measure a voltage sag condition.

5.5.2.23   RMS Voltage Swell Measurement Period

The duration in seconds used to measure a voltage swell condition.

5.5.2.24   RMS Voltage Sag Threshold

The RMS voltage below which a sag condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.25   RMS Voltage Swell Threshold

The RMS voltage above which a swell condition is reported. The threshold shall be configurable within the specified operating range of the Electricity Meter.

5.5.2.26   Standing Charge

A charge to be levied in Currency Units per unit time when operating in Credit Mode and Prepayment Mode.

5.5.2.27   Supply Tamper State

A setting to control the state of the Supply in the case of a Tamper Event being detected, being Disabled or unchanged.

5.5.2.28   Suspend Debt Disabled

A setting controlling whether debt should be collected when the ESMS is operating in Prepayment Mode and Supply is Disabled.

5.5.2.29   Suspend Debt Emergency

A setting controlling whether debt should be collected when the ESMS is operating in Prepayment Mode and the *Emergency Credit Balance*(*5.5.3.9*) is below the *Emergency Credit Limit(5.5.2.9)*.

5.5.2.30   Tariff Block Price Matrix

A 4 x 8 matrix containing prices for Block Pricing.

5.5.2.31   Tariff Switching Table

A set of switching rules for allocating half-hourly Consumption to a Tariff Register for Time-of-use Pricing and Time-of-use with Block Pricing. The rules stored within the table shall support at least 200 Time-of-use switching rules per annum.

The rules shall support allocation based on:

  i.   half-hour, half-hours and half-hour ranges;
  ii.   day, days and day ranges; and
  iii.   date, dates and date ranges.

All dates shall be specified as UTC.

5.5.2.32   Tariff Threshold Matrix

A 3 x 8 matrix capable of holding thresholds in kWh for controlling Block Tariffs.

5.5.2.33   Tariff TOU Price Matrix

A 1 x 48 matrix containing prices for Time-of-use Pricing.

5.5.2.34   Tariff Type

The Tariff type in operation, being Time-of-use or Time-of-use with Block.

5.5.3 Operational data

Describes data used by the functions of an ESMS for output of information.

5.5.3.1 Accumulated Debt Register

The debt resulting from the collection of *Standing Charge*(*5.5.2.26*) and/or Time-based Debt when no credit or Emergency Credit is available, when operating in Prepayment Mode.

5.5.3.2 Active Power Import

The import of Active Power measured by the ESMS.

5.5.3.3 Ambient Power

An indication of the ambient power level, being low, medium or high.

5.5.3.4 Average RMS Over Voltage Counter

The number of times the average RMS voltage, as calculated in §*5.3.10.1*, has been above the *Average RMS Over Voltage Threshold(5.5.2.1)* since last reset.

5.5.3.5 Average RMS Under Voltage Counter

The number of times the average RMS voltage, as calculated in §*5.3.10.1*, has been below the *Average RMS Under Voltage Threshold(5.5.2.2)* since last reset.

5.5.3.6 Average RMS Voltage Profile Data Log

A log for storing 4320 entries (including details of the period to which each entry relates) comprising the averaged RMS voltage for each *Average RMS Voltage Measurement Period*(*5.5.2.3*) arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

5.5.3.7 Billing Data Log

A log for storing the following date and time stamped entries of:

i. twelve entries comprising Tariff TOU Register Matrix*(5.5.3.18)* and *Tariff Block Counter Matrix(5.5.3.17)*;
ii. five entries comprising prepayment credits;
iii. ten entries comprising time-based debt payments;
iv. ten entries comprising payment-based debt payments; and
v. twelve entries comprising *Meter Balance(5.5.3.13)*, *Emergency Credit Balance(5.5.3.9)*, *Accumulated Debt Register(5.5.3.1)*, *Payment Debt Register(5.5.3.14)* and *Time Debt Registers [1 ... 2](5.5.3.19)*,

arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

5.5.3.8 Daily Read Log

A log for storing fourteen date and time stamped entries of the *Tariff TOU Register Matrix*(*5.5.3.18*), the *Tariff Block Counter Matrix*(*5.5.3.17*) and the *Total Active Import Register*(*5.5.3.21*) arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

5.5.3.9 Emergency Credit Balance

The amount of Emergency Credit available to the Consumer after it has been activated by the Consumer.

5.5.3.10 Event Log

A log for storing one hundred UTC date and time stamped entries of non-security related information for diagnosis and auditing, arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

5.5.3.11 Load Limit Counter

The number of times the Active Power Import has exceeded the *Load Limit Power Threshold*(*5.5.2.11*) since last cleared.

5.5.3.12 Load Switch State

The state of the Load Switch, being opened, closed or Armed.

5.5.3.13 Meter Balance

The amount of money in Currency Units as determined by the ESMS. If operating in Prepayment Mode, the Meter Balance represents the ESMS's determination of the amount of credit available to the Consumer (other than any *Emergency Credit Balance(5.5.3.9)*). If operating in Credit Mode, it represents the ESMS's determination of the amount of money due from the Consumer since the Meter Balance was last reset.

5.5.3.14 Payment Debt Register

Debt to be recovered as a percentage of payment when using Payment-based Debt Recovery in Prepayment Mode.

5.5.3.15 Profile Data Log

A log for storing date and time-stamped half hourly data arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten. The log shall be capable of storing a minimum of:

   i.   13 months of Active Energy Imported (Consumption);
   ii.   3 months of Active Energy Exported;
   iii. 3 months of Reactive Energy Imported; and
   iv.   3 months of Reactive Energy Exported.

5.5.3.16 Security Log

A log for storing one hundred UTC date and time stamped entries of security related information for diagnosis and auditing arranged as a circular buffer such that when full, further writes shall cause the oldest entry to be overwritten.

5.5.3.17 Tariff Block Counter Matrix

A 4 x 8 matrix for storing Block Counters for Block Pricing.

5.5.3.18 Tariff TOU Register Matrix

A 1 x 48 matrix for storing Tariff Registers for Time-of-use Pricing.

5.5.3.19   Time Debt Registers [1 … 2]

Two registers recording independent debts to be recovered over time when operating Time-based Debt Recovery in Prepayment Mode.

5.5.3.20   Total Active Export Register

The register recording the total cumulative Active Energy Exported.

5.5.3.21   Total Active Import Register

The register recording the cumulative Active Energy Imported.

5.5.3.22   Total Reactive Export Register

The register recording the cumulative Reactive Energy Exported.

5.5.3.23   Total Reactive Import Register

The register recording the cumulative Reactive Energy Imported.

6 In Home Display Technical Specification

6.1 Overview

This section defines the minimum physical requirements, minimum functional requirements, minimum interface requirements and minimum data requirements of an In-home Display installed to comply with the smart metering roll-out licence conditions (standard licence condition 34 of gas supply licences and standard licence condition 40 of electricity supply licences).

6.2 Physical requirements

An IHD shall as a minimum include the following components:

   i.   a Data Store;
   ii. a HAN Interface; and
   iii. a User Interface.

An IHD shall be mains powered and shall be capable of operating at a nominal voltage of 230VAC and consuming no more than an average of 0.6 watts of electricity under normal operating conditions.

An IHD shall:

   iv. display the *Device Identifier(6.5.1.1)*.

The HAN Interface of an IHD shall be capable of supporting communications based on Open Standards.

An IHD shall be designed to enable the information displayed on it to be easily accessed and presented in a form that is clear and easy to understand including by Consumers with impaired:

   v.   sight;
   vi.   memory and learning ability;
   vii. perception and attention; or
   viii. dexterity.

6.3 Functional requirements

This section defines the minimum functions that an IHD shall be capable of performing.

6.3.1 Communications

An IHD shall be capable of establishing Communications Links via its HAN Interface.

An IHD shall be capable of ensuring that the security characteristics of all Communications Links it establishes meet the requirements set-out in §*6.3.4.2*.

6.3.1.1 Communications with a GSMS or ESMS

An IHD shall be capable of establishing a Communications Link via its HAN Interface with a GSMS or ESMS as appropriate.

In establishing the Communications Link, the IHD shall be capable of providing Security Credentials to enable it to be Authenticated by the GSMS or ESMS as appropriate.

Where it has established a Communications Link, the IHD shall be capable of:

   i.   receiving the information (set-out in §*4.4.1*) from the GSMS; or (as appropriate)
   ii. receiving the information (set-out in §*5.4.1*) from the ESMS.

The IHD shall be capable of detecting a failure of a Communications Link and on detection of a failure, shall be capable of clearing or suitably annotating the information displayed on its User Interface (set out in §*6.3.2* or §*6.3.3* as appropriate) to indicate that the information may be out of date.

6.3.2 Information pertaining to the Supply of gas to the Premises

An IHD shall be capable immediately upon establishment of a Communications Link with a GSMS (as set out in §*6.3.1.1*), of providing the following information[2] on its User Interface and providing updates of any changes to the information every 30 minutes thereafter.

The IHD shall be capable of displaying Currency Units in GB Pounds and European Central Bank Euro.

6.3.2.1 Active Tariff Price [NUM]

The active Tariff Price for Energy Consumption in Currency Units per kWh.

6.3.2.2 Connection Link Quality

The signal quality of the Communications Link with a GSMS.

6.3.2.3 Cumulative Consumption [NUM]
   i.   Current Day cumulative Energy Consumption;
   ii.   Current Day cost to the Consumer of cumulative Energy Consumption in Currency Units;
   iii. Current Week cumulative Energy Consumption;
   iv.   Current Week cost to the Consumer of cumulative Energy Consumption in Currency Units;
   v.   Current month cumulative Energy Consumption; and
   vi.   Current month cost to the Consumer of cumulative Energy Consumption in Currency Units.

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[2] Information that shall be capable of being provided in numerical form is annotated [NUM]. Information that shall be capable of being provided in Ambient form is annotated [AMB]. Where information is not annotated the information may be provided in any visual format.

6.3.2.4 Debt [NUM]

Either Aggregate Debt, or Time-based Debt and Payment-based Debt on the GSMS operating in Prepayment Mode.

6.3.2.5 Debt Recovery Rate [NUM]

Either Aggregate Debt recovery rate or each Time-based Debt Recovery rate on the GSMS operating in Prepayment Mode.

6.3.2.6 Emergency Credit Balance [NUM]

The emergency credit balance if Emergency Credit is activated in the GSMS (including a clear indication that Emergency Credit has been activated).

6.3.2.7 Historic Consumption
   i.   D-1 to D-8 historic Energy Consumption;
   ii.   D-1 to D-8 cost to the Consumer of historic Energy Consumption in Currency Units;
   iii. W-1 to W-5 historic Energy Consumption;
   iv.   W-1 to W-5 cost to the Consumer of historic Energy Consumption in Currency Units;
   v.   M-1 to M-13 historic Energy Consumption; and
   vi.   M-1 to M-13 cost to the Consumer of historic Energy Consumption in Currency Units.

where: D-1 = current Day minus 1, D-2 = current Day minus 2, W-1 = current Week minus 1, M-1 = current month minus 1, etc.

6.3.2.8 Local Time

The Local Time as derived from UTC.

6.3.2.9 Low Credit Alert

An indication that the combined gas meter balance and gas emergency credit balance (if Emergency Credit is activated) has fallen below the GSMS low credit threshold.

6.3.2.10   Meter Balance [NUM]

The amount of money in Currency Units as determined by the GSMS. If operating in Prepayment Mode, the Meter Balance represents the GSMS's determination of the amount of credit available to the Consumer (excluding any *Emergency Credit Balance [NUM](6.3.2.6)*). If operating in Credit Mode, it represents the GSMS's determination of the amount of money due from the Consumer since the Meter Balance was last reset.

6.3.2.11   Payment Mode

The current mode of operation of the GSMS, being Prepayment Mode or Credit Mode.

6.3.3 Information pertaining to the Supply of electricity to the Premises

An IHD shall be capable, upon establishment of a Communications Link with an ESMS (as set out in §*6.3.1.1*), of providing the following information[3] on its User Interface and providing updates of any changes to the information every 10 seconds thereafter.

The IHD shall be capable of displaying Currency Units in GB Pounds and European Central Bank Euro.

6.3.3.1 Active Tariff Price [NUM]

The active Tariff Price for Energy Consumption in Currency Units per kWh.

6.3.3.2 Connection Link Quality

The signal quality of the Communications Link to an ESMS.

6.3.3.3 Cumulative Consumption [NUM]
  i.   Current Day cumulative Energy Consumption;
  ii.   Current Day cost to the Consumer of cumulative Energy Consumption in Currency Units;
  iii. Current Week cumulative Energy Consumption;
  iv.   Current Week cost to the Consumer of cumulative Energy Consumption in Currency Units;
  v.   Current month cumulative Energy Consumption; and
  vi.   Current month cost to the Consumer of cumulative Energy Consumption in Currency Units.

6.3.3.4 Debt [NUM]

Either Aggregate Debt, or Time-based Debt and Payment-based Debt on the ESMS operating in Prepayment Mode.

6.3.3.5 Debt Recovery Rate [NUM]

Either Aggregate Debt recovery rate or each Time-based Debt Recovery rate on the ESMS operating in Prepayment Mode.

6.3.3.6 Emergency Credit Balance [NUM]

The emergency credit balance if Emergency Credit is activated in the ESMS (including a clear indication that the Emergency credit has been activated).

6.3.3.7 Historic Consumption
  i.   D-1 to D-8 historic Energy Consumption;
  ii.   D-1 to D-8 cost to the Consumer of historic Energy Consumption in Currency Units;
  iii. W-1 to W-5 historic Energy Consumption;

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[3] Information that shall be capable of being provided in numerical form is annotated [NUM]. Information that shall be capable of being provided in Ambient form is annotated [AMB].Information not annotated may be provided in any visual format.

iv.   W-1 to W-5 cost to the Consumer of historic Energy Consumption in Currency Units;

v.   M-1 to M-13 historic Energy Consumption; and

vi.   M-1 to M-13 cost to the Consumer of historic Energy Consumption in Currency Units.

where: D-1 = current Day minus 1, D-2 = current Day minus 2, W-1 = current Week minus 1, M-1 = current month minus 1 etc.

6.3.3.8 Instantaneous Active Power Import [NUM]

i.   A near real-time indication of the Active Power Import in kW; and

ii.   The cost to the Consumer of that Instantaneous Active Power Import.

6.3.3.9 Local Time

The Local Time as derived from UTC.

6.3.3.10   Low Credit Alert

An indication that the combined electricity meter balance and electricity emergency credit balance (if Emergency Credit is activated) has fallen below the ESMS low credit threshold.

6.3.3.11   Meter Balance [NUM]

The amount of money in Currency Units as determined by the ESMS. If operating in Prepayment Mode, the Meter Balance represents the ESMS's determination of the amount of credit available to the Consumer (excluding any *Emergency Credit Balance [NUM](6.3.3.6)*). If operating in Credit Mode, it represents the ESMS's determination of the amount of money due from the Consumer since the Meter Balance was last reset.

6.3.3.12   Payment Mode

The current mode of operation of the ESMS, being Prepayment Mode or Credit Mode.

6.3.3.13   Power Threshold Status [AMB]

An indication of the level of Active Power Import as high, medium or low.

6.3.4 Security

6.3.4.1 General

The IHD shall be designed taking all reasonable steps to ensure that it is capable of protecting Personal Data and Security Credentials at all times from disclosure or modification that is not Authorised.

An IHD shall be designed taking all reasonable steps so as to ensure that any failure or compromise of its Integrity shall not compromise the Integrity of any other Device to which it is connected by means of a Communications Link.

6.3.4.2 Communications

An IHD shall be capable of preventing and detecting, on all of its interfaces, Unauthorised access that could compromise the Confidentiality and/or Data Integrity of:

i.   Personal Data whilst being transferred via an interface; and
ii.   Security Credentials whilst being transferred via an interface.

An IHD shall be capable of employing techniques to protect against Replay Attacks of information used to Authenticate the identity of a system or individual.

6.4 Interface Requirements

This section sets out the minimum required interactions which an IHD shall be capable of undertaking with a GSMS or ESMS as appropriate via its HAN Interface.

6.4.1 Receipt of information via the HAN Interface

An IHD shall be capable, immediately upon establishment of a Communications Link with a GSMS (as set out in §*6.3.1.1*) of receiving information (and updates of any changes of this information every 30 minutes thereafter) required to meet the display requirements set out in §*6.3.2*.

An IHD shall be capable, immediately upon establishment of a Communications Link with an ESMS (as set out in §*6.3.1.1*) of receiving information (and updates of any changes of this information every 10 seconds thereafter) required to meet the display requirements set out in §*6.3.3*.

6.5 Data requirements

This section describes the minimum information which an IHD is to be capable of holding in its Data Store.

6.5.1 Constant data

Describes data that remains constant and unchangeable at all times.

6.5.1.1 Device Identifier

An identifier used to uniquely identify each IHD installed to comply with the smart metering roll-out licence conditions.

7 Glossary

7.1.1.1 Active Energy

The integral with respect to time of the Active Power in units of watt-hours (Wh) or standard multiples thereof (for example, kWh).

7.1.1.2 Active Power

The product of voltage and the in-phase component of alternating current measured in units of watts (W) or standard multiples thereof (for example, kW).

7.1.1.3 Aggregate Debt

The sum of all Time-based and Payment-based Debt registers on a GSMS or ESMS operating in Prepayment Mode.

7.1.1.4 Alarm

A short-lived audible signal.

7.1.1.5 Alert

A warning generated in response to a problem or the risk of a potential problem.

7.1.1.6 Ambient

The representation of information in a form that can be understood at a glance.

7.1.1.7 Armed

Means the Valve is in a state whereby it will open in response to a Command to Enable Supply for a GSMS or the Load Switch is in a state whereby it will close in response to a Command to Enable Supply for an ESMS.

7.1.1.8 Arm Load Switch

To establish a state whereby a Load Switch will close in response to a Command to Enable Supply and "Arming" shall be construed accordingly.

7.1.1.9 Arm Valve

To establish a state whereby a Valve will open in response to a Command to Enable Supply and "Arm the Valve" and "Arming the Valve" shall be construed accordingly.

7.1.1.10 Authentication

The method used to confirm the identity of entities or Devices wishing to communicate and "Authenticated" and "Authenticity" shall be construed accordingly.

7.1.1.11 Authorisation

The process of granting access to a resource and "Authorised" shall be construed accordingly.

7.1.1.12 Battery

A component that produces electricity from a chemical reaction.

7.1.1.13   Block Counter

Storage for recording Consumption for the purposes of combined Time-of-use and Block Pricing.

7.1.1.14   Block Pricing

A pricing scheme use in conjunction with Time-of-use Pricing where Price varies based on Consumption over a given time period.

7.1.1.15   Block Tariff

A Tariff for Block Pricing.

7.1.1.16   Clock

A timing mechanism operating the UTC primary time standard which has a minimum resolution of 1 second.

7.1.1.17   Command

An instruction to perform a function received via the User Interface or the WAN Interface.

7.1.1.18   Communications Link

A means of communication between a system or Device and another system or Device to exchange information.

7.1.1.19   Confidentiality

Ensuring that information, in transit or at rest, is not accessible by Unauthorised parties through either unintentional means or otherwise.

7.1.1.20   Consumer

A person who lawfully resides at the premises that is being Supplied.

7.1.1.21   Consumer Device

An IHD or any other Device incorporating a HAN Interface with the means of providing a Consumer access to the information stored in the GSMS or ESMS (as appropriate) via that interface.

7.1.1.22   Consumption

Means in the context of a GSMS Gas Consumption and in the context of an ESMS Electricity Consumption.

7.1.1.23   Credit Mode

A mode of operation of a GSMS or ESMS whereby Consumers are billed for some or all of their Consumption retrospectively.

7.1.1.24   Cryptographic Algorithm

An algorithm for performing one or more of the following functions: Encryption; Decryption; digitally signing or hashing of information, data, or messages; or exchange of Security Credentials.

7.1.1.25 Currency Units

The units of monetary value in major and minor units.

7.1.1.26 Data Integrity

The state of data being unaltered by parties not Authorised.

7.1.1.27 Data Store

An area of a GSMS or an ESMS capable of storing information for future retrieval.

7.1.1.28 Day

The period commencing 00:00:00 Local Time and ending at the next 00:00:00.

7.1.1.29 Decryption

The process of converting encrypted information by an Authorised party to recover the original information and like terms shall be construed accordingly.

7.1.1.30 Designated Premises

Shall in the context of an GSMS have the meaning given to that term in standard condition 1 of gas supply licences, and in the context of an ESMS have the meaning given to that term in standard licence condition 1 of electricity supply licences.

7.1.1.31 Device

A physically distinct part of a system.

7.1.1.32 Disable

In the context of a GSMS the act of interrupting the flow of gas by closing the Valve and in the context of an ESMS the act of interrupting the flow of electricity by opening the Load Switch and like terms shall be construed accordingly.

7.1.1.33 Domestic Premises

Shall in the context of a GSMS have the meaning given to that term in standard condition 1 of gas supply licences, and in the context of an ESMS shall have the meaning given to that term standard condition 1 of electricity supply licences.

7.1.1.34 Electricity Consumption

The Active Energy Imported into the Premises and "Consumed" shall be construed accordingly.

7.1.1.35 Electricity Meter

An instrument used to measure, store and display the amount of electrical energy passing through an electrical circuit or circuits.

7.1.1.36 Emergency Credit

Credit (that can be made available) to ensure that the Supply is not interrupted in circumstances (including situations of emergency) defined by the Supplier to the Premises.

7.1.1.37   Enable

In the context of a GSMS the act of restoring the flow of gas to the Premises by opening the Valve and in the context of an ESMS the act of restoring the flow of electricity to the Premises by closing the Load Switch and like terms shall be construed accordingly.

7.1.1.38   Encryption

The process of converting information in order to make it unintelligible other than to Authorised parties and like terms shall be construed accordingly.

7.1.1.39   Energy Consumption

The amount of gas in kWh or electricity in kWh supplied to the Premises.

7.1.1.40   ESMS

Electricity Smart Metering System.

7.1.1.41   Export

The flow of electricity out of the Premises, and like terms shall be construed accordingly.

7.1.1.42   Firmware

The embedded software programmes and/or data structures that control electronic Devices.

7.1.1.43   Gas Consumption

The volume of gas in cubic metres (m^3) supplied to the Premises and "Consumed" shall be construed accordingly.

7.1.1.44   Gas Meter

An instrument designed to measure, memorise and display the quantity of gas (volume or mass) that has passed through it.

7.1.1.45   GSMS

Gas Smart Metering System.

7.1.1.46   Head End System (HES)

A system which provides a centralised means by which an Authorised party can access Gas Smart Metering Systems and/or Electricity Smart Metering Systems (as the case may be) by the sending of Commands and receiving of Responses and Alerts across the Wide Area Network Interface.

7.1.1.47   Home Area Network Interface (HAN Interface)

A component of a GSMS, ESMS, IHD or other Consumer Device that is capable of sending and receiving information to/from Consumer Devices.

7.1.1.48   IHD

In-home Display.

7.1.1.49 Import

The flow of electricity into the Premises, and like terms shall be construed accordingly.

7.1.1.50 Integrity

The state of a system where it is performing its intended functions without being degraded or impaired by changes or disruptions.

7.1.1.51 Load Switch

A component that can close or open (including on receipt of a Command to that effect) to Enable or Disable the flow of electricity to and from the Premises.

7.1.1.52 Local Time

Time as UTC with adjustment for British Summer Time.

7.1.1.53 Microgeneration Meter

An instrument used to measure microgeneration (as such term is defined in Section 82 of the Energy Act 2004) and which is designed to communicate with the ESMS via the ESMS's HAN Interface.

7.1.1.54 Open Standards

The following are the minimal characteristics that a specification and its attendant documents must have in order to be considered an open standard:

i.   The standard is adopted and will be maintained by a not-for-profit organisation, and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.);
ii.   The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee;
iii. The intellectual property - i.e. patents possibly present - of (parts of) the standard is made available: irrevocably on a royalty free basis; or, on a reasonable and non-discriminatory (RAND) basis; and
iv.   There are no constraints on the re-use of the standard.

7.1.1.55 Outcome

The result of executing a Command, expressed as success or failure.

7.1.1.56 Payment-based Debt Recovery

A means of recovering debt based on a percentage of a payment.

7.1.1.57 Personal Data

Any information comprising Personal Data as such term is defined in the Data Protection Act 1998 at the date the SMETS is designated by the Secretary of State.

7.1.1.58 Premises

The premises which is Supplied.

7.1.1.59 Prepayment Mode

A mode of operation of a GSMS or ESMS whereby payment is generally made in advance of Consumption.

7.1.1.60 Price

The amount of money in Currency Units charged for one kWh unit of gas Consumed for a GSMS or one kWh of electricity Consumed for an ESMS.

7.1.1.61 Random Number Generator

A component used to generate a sequence of numbers or symbols that lack any predictable pattern.

7.1.1.62 Reactive Energy

The integral with respect to time of Reactive Power in units of volt-amperes reactive-hours (varh) or standard multiples thereof (for example, kvarh).

7.1.1.63 Replay Attack

A form of attack on a Communications Link in which a valid information transmission is repeated through interception and retransmission.

7.1.1.64 Response

Sent on the User Interface or WAN Interface containing information and/or Outcome from the execution of a Command.

7.1.1.65 RMS

Root mean squared.

7.1.1.66 Secure Perimeter

A physical border surrounding the GSMS or ESMS which is capable of preventing and detecting physical access from Unauthorised persons.

7.1.1.67 Security Credentials

Data used to identify and Authenticate an individual or system.

7.1.1.68 Sensitive Event

Each of the following events:

i. a failed Authentication or Authorisation;
ii. a change in the executing Firmware version;
iii. the detection of Unauthorised Physical Access or any other occurrence that has the potential to put Supply at risk and/or compromise the Integrity of the GSMS;
iv. unusual numbers of malformed, out-of-order or unexpected Commands received;
v. a change of credit which is not reflective of normal Consumption; and
vi. any other threat to its security detected by a GSMS or ESMS.

7.1.1.69 Smart Metering Equipment Technical Specifications (SMETS)

The document designated by the Secretary of State to describe the minimum capabilities of equipment installed to satisfy the roll-out licence conditions.

7.1.1.70 Supplier

Means a person authorised by licence to Supply gas to Premises for a GSMS and a person authorised by licence to Supply electricity to Premises for an ESMS.

7.1.1.71 Supply

The supply of gas to Premises for a GSMS and the supply of electricity to Premises for an ESMS and "Supplied" shall be construed accordingly.

7.1.1.72 Tamper Event

The detection of Unauthorised Physical Access or any other occurrence that has the potential to put Supply at risk and/or compromise the Integrity of the GSMS or ESMS.

7.1.1.73 Tariff

The structure of Prices and other charges relating to a Supply.

7.1.1.74 Tariff Register

Storage for recording Consumption for the purposes of Time-of-use Pricing.

7.1.1.75 Time-based Debt Recovery

A means of recovering debt based on an amount in Currency Units per unit time.

7.1.1.76 Time-of-use Band

A contiguous or non-contiguous number of days for a GSMS or half-hour periods for an ESMS over which Tariff Prices are constant.

7.1.1.77 Time-of-use Pricing

A pricing scheme with one or more Time-of-use Bands.

7.1.1.78 Time-of-use Tariff

A Tariff for Time-of-use Pricing.

7.1.1.79 TOU

Time-of-use.

7.1.1.80 Trusted Source

Means a source whose identity is confidently and reliably validated, such as an individual or system, where the identity is established either directly via a credential such as a password, or indirectly whereby a third party vouches for the identity of the individual or system.

7.1.1.81 Unauthorised

Means not Authorised.

7.1.1.82 Unauthorised Disclosure

The release of information to a person who is not Authorised to receive the information.

7.1.1.83 Unauthorised Physical Access

Unauthorised access to the internal components of any Device within a GSMS or ESMS through the physical outer casing.

7.1.1.84 Unique Transaction Reference Number (UTRN)

A cryptographic code used to convey credit through human transfer to a GSMS or ESMS operating in Prepayment Mode.

7.1.1.85 User Interface

An interface for providing local human interaction with a GSMS, ESMS or IHD which supports input, visual and audible output.

7.1.1.86 UTC

Coordinated Universal Time.

7.1.1.87 Valve

A component that can open or close (including on receipt of a Command to that effect) to Enable or Disable the flow of gas to Premises.

7.1.1.88 Week

The seven day period commencing 00:00:00 Monday Local Time and ending at 00:00:00 on the immediately following Monday.

7.1.1.89 Wide Area Network Interface (WAN Interface)

A component that is capable of sending information to and receiving information from a Head End System.