Schedule 19

Chapter 6

Metering Code of Practice S6

Code for the Metering of Energy Imports via Low Voltage Circuits at 100 Amps or less per phase for Allocation purposes

Issue 1

Shepherd & Wedderburn WS

Saltire Court
20 Castle Terrace
Edinburgh EH1 2ET

Tel: 0131-228 9900
Fax: 0131-228 1222

155 St Vincent Street
GLASGOW
G2 5NR

Tel: 0141-566 9900
Fax: 0141-565 1222

CODE FOR THE METERING OF ENERGY IMPORTS VIA LOW VOLTAGE CIRCUITS AT 100 AMPS OR LESS PER PHASE FOR ALLOCATION PURPOSES

Foreword

Introductions: This Metering Code of Practice ("Code") forms part of the Settlement Agreement for Scotland ("the Agreement"). In the event of inconsistency between the provisions of this Code and the other provisions of this Agreement, Clause 1.4 (Hierarchy in this Agreement) shall apply.

Technical equivalent: This Code is technically equivalent to Code of Practice 6 version 4.10 in England and Wales.

Purpose: This Code defines the minimum requirements for direct connected Metering Equipment at the point of connection and/or supply for the metering of energy via low voltage circuits fused at 100 Amps or less per phase.

Copies: Scottish Electricity Settlements Limited ("Scottish Settlements") shall retain copies of the Code in accordance with the provisions of this Agreement.

1. Scope

1.1 *Scope*: This Code states the practices that shall be employed, and the facilities that shall be provided for the measurement and recording of the quantities required for Allocation purposes.

This Code specifically applies to the direct connected Metering Equipment to be installed for the metering of energy imports via low voltage circuits fused at 100 Amps or less per phase.

1.2 *Extent*: Reactive Energy measurement is not specifically covered within this Code, where kVA and/or kVAr are required Metering Code of Practice S5 equipment shall be used.

It will be noted this Code and Metering Code of Practice S7 apply to the same circuit consumption. For clarity the distinction is that this Code sets out the requirements for Allocation Metering Equipment and Code of Practice S7 specifies the settlement requirements as part of a wider metering and data collection infrastructure providing data to the data processing interface. Metering Code of Practice S7 does not require Metering Code of Practice S6 Meters to be used. It would however be possible to construct a Metering Code of Practice S7 system using Metering Code of Practice S6 metering.

The Metering Equipment shall be categorised into polyphase and single phase metering and one of the following types, dependent upon the period for which the equipment is able to record the Allocation information and this Code applies to the following:-

1.2.1 Part a - minimum storage period of 20 days;

1.2.2 Part b - minimum storage period of 100 days;

1.2.3 Part c - minimum storage period of 250 days; or

1.2.4 Part d - minimum storage period of 450 days.

This Code does not contain the calibration, testing and commissioning requirements for Metering Equipment used for Allocation purposes. These requirements are detailed in Metering Code of Practice S4 -

"Metering Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Allocation Purposes".

1.3 *Derogations*: Derogations from the requirements of this Code may be sought in accordance with Part IX (Governance of this Agreement) or exist under Schedule 7 (Derogations) of the Agreement and those Derogations existing under Schedule 7 and applicable to all Parties are listed in Appendix 6.

1.4 *Responsibility*: Where responsibilities and obligations contained in this Code are expressed as being responsibilities and obligations of a Meter Operator, the Associated Responsible Party shall procure that any Meter Operator appointed by it pursuant to Clause 24.2 (Appointment of Meter Operators for Bulk Supply Points), Clause 39 (Appointment of Supplier Agents) or Clause 54 (Generator Agents) complies with such responsibilities and obligations or may, if permitted to do so by the terms of this Agreement, perform such responsibilities and obligations itself.

1.5 *Nominated agent*: Where there is a reference to Scottish Settlements having a right or a duty to receive information or to provide a checking role under this Code that information may be received or that role may be performed by Scottish Settlements or any agent nominated by Scottish Settlements.

2. References

2.1 *References*: The following documents are also referred to in the text:-

BS EN 61036	Alternating-Current Static Watt Hour Meters for Active Energy (Classes 1 and 2);
BS EN 60521	Class 0.5, 1 and 2 Alternating-Current Watt Hour Meters;
S1 792	The Meters (Certification) Regulations 1990;
IEC 1334-4-4-41	Application Protocols: Distribution Line Message Specification;

BS EN 61107	Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange;
Metering Code of Practice S4	Metering Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Allocation Purposes;
Electricity Act 1989	Schedule 7 as amended from time to time;
Code of Practice S5	Code of Practice for the Metering of Energy Transfers with a Maximum Demand of up to (and including) 1MW for Settlement Purposes;
Code of Practice S7	Code of Practice for Metering of Energy Imports via Low Voltage Circuits Fused at 100 Amps or Less per Phase for Settlement Purposes;
Meter Operators Code of Practice	Schedule 5 to the Agreement between Meter Operators and Public Electricity Suppliers governing arrangements for safety and technical competence.

3. Definitions

3.1 *Definitions*: Save as otherwise expressly provided herein, words and expressions used in this Code shall have the meanings attributed to them in Schedule 1 of the Agreement (Definitions) which for ease of reference are repeated in Appendix 7.

4. Measurement Criteria

4.1 *Measured quantities*: For each separate circuit the following energy measurements are required for Allocation purposes:-

Import kWh

4.2 *Accuracy requirements*: The overall accuracy of the energy measurements shall at all times be within the limits of error specified in SI792 Regulation 8 pertaining to Schedule 7 of the Act. Meters where certified shall be certified in accordance with Schedule 7 of the Act.

4.3 *Evidence*: to verify that these overall accuracy requirements are met shall be available for inspection by Scottish Settlements.

5. Metering Equipment criteria

Clarification: Although for clarity this Code identifies separate items of equipment, nothing in it prevents such items being combined to perform the same task provided the requirements of this Code are met. Where separate items are provided they shall be individually protected against electrical overload.

Service Life: All Metering Equipment (including, if any, energy storage device) shall have a minimum design service life, without maintenance of 10 years from the date of manufacture.

5.1 *Meters*:

5.1.1 For each circuit direct connected Meters shall be used in accordance with Schedule 7 of the Act.

5.1.2 New Meters shall meet the requirements of either BS EN 61036 Class 2 or BS EN 60521 Class 2. The rating for a single phase Meter shall be 230 volts, 50Hz, 20 Amps basic or less and 100 Amps maximum and for polyphase Meters 230/400 volts, 50Hz, 40 Amps basic or less and 100 Amps maximum current. Existing Meters may be used provided they were manufactured to the relevant British Standards. Ratings different from those quoted may be utilised provided they are appropriate for the supply being metered.

5.1.3 Meters which provide data to separate Outstations shall provide an output for this purpose.

5.2 *Outstation*: An Outstation system shall be provided which transfers data to and receives data from a Settlement Instation and which shall comply

with the relevant requirements contained in BS EN 61036 for indoor conditions.

Separate Outstations storing data from a number of different circuits up to a maximum consumption of 1GWh, and Meters with integral Outstation facilities may be cascaded on to one communication line.

Normally metering data will be collected by the Settlement Instation in accordance with the following timescales, dependent upon which category of Metering Equipment that has been installed:-

Section 2.1.1 - daily interrogation Code S6(a).

Section 2.1.2 - up to monthly interrogation Code S6(b).

Section 2.1.3 - up to quarterly interrogation Code S6(c).

Section 2.1.4 - up to yearly interrogation Code S6(d).

Repeat collections of metering data shall be possible throughout the Outstation data storage period.

The Outstation shall have the ability to allow the metering data to be read by instations other than the Settlement Instation provided the requirements of Section 8 of this Code are satisfied.

A unique Outstation identification code shall be provided for the purpose of transferring stored metering data to a Settlement Instation.

Where an Outstation has a primary battery to provide back-up for the clock and calendar, this battery shall have a minimum standby service life of three (3) years from the date of manufacture of the Outstation i.e. supporting the clock for three (3) years without mains power.

Where energy storage devices other than primary batteries are used, the clock and calendar shall be supported for a period of seven (7) days without an external supply connected to cater for extended supply failure.

In the event of an Outstation supply failure, the Outstation shall retain all data stored up to the time of the failure, and maintain the time accuracy in accordance with Section 6.2.2. These time accuracy requirements do not apply where the Outstation clock is re-synchronised from a broadcast clock when re-energised (refer to Section 6.2.3).

Any "reading" or "reprogramming" operation shall not delete or alter any stored energy consumption data or associated alarms.

Where the Outstation is storing data for more than one circuit it shall continue to operate while any one circuit is energised.

The Outstation shall be clearly marked with the relevant part of Code S6, i.e. a, b, c or d.

5.2.1 Data provision requirements: This Section sets out the data to be provided by the Outstation and the duration of storage required. For the avoidance of doubt all metering data shall be output in engineering units i.e. kWh. Data shall be provided as follows and is specifically defined in Appendix 1:

5.2.1.1 For each interrogation of the Outstation the data provided shall be:-

(i) the Meter identifier 12 characters alphanumeric as defined in Appendix 1b. Where a separate Outstation is used the channel ID shall be the Meter ID;

(ii) the date and time of interrogation [YYMMDDhhmmss];

(iii) kWh cumulative total Meter advance register value for each Meter to 6 digit integer kWh value padded with leading zeroes where appropriate;

(iv) for polyphase metering the Maximum Demand (MD), 6 digit (4 integer and 2 decimal places) kW value, padded with leading zeroes where appropriate, for each Meter for both the current and previous programmable charging period e.g. monthly, statistical review period, as required by the Responsible Party and cumulative Maximum Demand;

(v) date of Maximum Demand reset [YYMMDD];

(vi) number of Maximum Demand resets;

(vii) multi-rate cumulative Active Energy registers as specified by Responsible Party; and

(viii) number of days data returned from the Meter.

5.2.1.2 The Outstation shall provide the following information for each day and for the current day up to the time of interrogation:-

(i) calendar day date [YYMMDD];

(ii) kWh cumulative total register value for each Meter to 8 digit (including 2 decimal place) kWh value padded with leading zeroes where appropriate;

(iii) where a battery is fitted, a battery change maintenance flag shall be provided based on standby battery service life;

(iv) an indication should clock failure occur e.g. When the system clock has failed due to power or battery failure;

(v) the number of level 2 successful password accesses made on that day to a maximum of 7;

(vi) MD reset flag as appropriate; and

(vii) a flag to indicate a power outage for the whole of a Settlement Day.

5.2.1.3 For each Demand Period the Outstation will provide, for each Meter:

(i) truncated absolute Cumulative Register reading in the range 10s of kWh, kWh, 1/10 kWh and 1/100 kWh;

(ii) a flag to indicate if net reverse energy flow has taken place over all phases;

(iii) a flag to indicate successful level 2 password access; and

(iv) a flag to indicate that the power supply to the Outstation has failed.

5.2.1.4 A data capacity of 48 periods per day for the number of days specified below dependent upon the category of Metering Equipment shall be provided:-

(i) Section 2.1.1 - minimum storage period of 20 days Code S6 part (a);

(ii) Section 2.1.2 - minimum storage period of 100 days Code S6 part (b).

(iii) Section 2.1.3 - - minimum storage period of 250 days Code S6 part (c).

(iv) Section 2.1.4 - minimum storage period of 450 days Code S6 part (d).

Where the prescribed data storage period is exceeded the Meter shall begin to wrap data i.e. replace the first reading with that of the latest reading.

5.2.1.5 The value of any energy measured in a Demand Period but not stored in that Demand Period shall be carried forward to the next Demand Period.

Any discrepancy between the measured value of Active Energy at each individual Metering Point and the equivalent data

presented by the Outstation for the same Metering Point shall not exceed ±0.5% at full load at that Metering Point.

An Outstation shall provide any portion of the data stored upon request by an instation.

5.2.2 Time keeping: The Outstation time shall be set to Co-ordinated Universal Time (UTC). No switching between UTC and British Summer Time (BST) shall occur for Allocation data storage requirements.

Time synchronisation of the Outstation may be carried out using 30 minute synchronising pulses or broadcast clocks up to a maximum limit of ±1 second per Demand Period without setting any password access flags.

The clock of the Outstation shall be capable of being set or adjusted using the local or remote communications parts but only once during any demand period.

The overall limits of error for the time keeping shall be:-

5.2.2.1 the completion of each Demand Period shall be at a time which is within ± 6 minutes of UTC;

5.2.2.2 the duration of each Demand Period shall be within ± 0.6%, except where time synchronisation has occurred in a Demand Period; and

5.2.2.3 the variation in the completion of each Demand Period shall not exceed 20 seconds over 20 day period.

5.2.3 Monitoring facilities: Broadcast clock monitoring facilities shall be provided for each of the following conditions and shall be reported, tagged wherever possible to the relevant Demand Period(s), via the local interrogation facility:-

5.2.3.1 for complete power outages up to three seconds in duration, the real time clock shall continue without interruption. This power outage event

shall not cause the power outage flag or the successful level two password flag to be set at the time of power restoration;

5.2.3.2 for power outages longer than three seconds and where power has now been restored, the clock shall start and continue from the time of failure until the broadcast clock is detected and successfully decoded, within the normal operating constraints of the broadcast clock system, the clock shall reset to UTC and the power failure flag and the successful level two access password flag shall be set for the returning Demand Periods where the power outage existed; and

5.2.3.3 where the broadcast clock cannot be detected by the Outstation, within the normal operating constraints and messaging protocols of the broadcast clock system, the clock failure flag shall be set for that day. The Outstation shall continue to maintain system clock accuracy as detailed in Section 6.2.2 in the absence of the broadcast clock.

5.3 *Displays and facilities*: The Metering Equipment shall display the following information (not necessarily simultaneously):

5.3.1 total Import cumulative kWh per circuit, 6 digit integer kWh value padded with leading zeroes where appropriate for polyphase and 5 digit integer kWh value padded with leading zeroes where appropriate for single phase Meters; and

5.3.2 current UTC or clock time and date as defined by the Associated Responsible Party.

The Metering Equipment shall be capable of enabling the display of the following information:

5.3.3 for polyphase Meters:

5.3.3.1 Maximum Demand ("MD") in 6 digit (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate for the current and historic programmable charging period;

5.3.3.2 twice the kWh advance since the commencement of a current Demand Period, (i.e. "kW rising demand") to 6 digits (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate for the current and historic programmable charging period;

5.3.3.3 cumulative MD, 6 digit (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate;

5.3.3.4 last two digits of the number of MD resets (99 rollover to zero); and

5.3.3.5 multi-rate display sequence as specified by Supplier, with a minimum of 8 registers selectable over the calendar year. Further details are set out in Appendix 5.

5.3.4 for single phase Meters: multi-rate display sequence as specified by Supplier, with a minimum of 4 registers selectable over the calendar year. Further details are set out in Appendix 5.

Where a multi-rate display sequence is enabled on a Meter, the default display shall be the cumulative kWh register of the active rate and the rate identifier. The initial operation of the display selector shall display the test display and the next operation shall display the total Import cumulative kWh. Subsequent operation of the display selector shall display registers in a sequence specified by the Supplier.

5.4 *Communications*: Outstations shall always provide local interrogation facilities via an accessible port.

5.4.1 Local interrogation: An interrogation port shall be provided for each Outstation which shall be an optical port to the standard of BS EN 61107. Data protocol shall be to the standard defined in Appendix 1 (a and b), Appendix 2 (a and b) and Appendix 3.

5.4.1.1 The outline data structure for the information required in Section 6.2.1 is detailed in Appendix 1b.

5.4.1.2 The detailed application data structure and format for the data items specified in Section 6.2.1 is detailed in Appendix 1b.

5.4.1.3 The data definitions and descriptions are detailed in Appendix 2a. The functional overlay specified in Section 6.4.3 is detailed in Appendix 2b (protocol examples).

5.4.1.4 The Outstation shall have a maximum transfer time of 90 seconds per 100 days for each Meter through the local data port for the data specified above.

5.4.2 Remote interrogation: Where remote interrogation facilities are provided with error checking it shall not be possible to disconnect this link at the Outstation without the breaking of an Allocation seal. The data shall be to the standard and structure set out in Appendix 1b.

5.4.3 Standard protocol: The protocol shall be standard for all Outstations for the following settlement functions for the data specified in 6.2.1:

5.4.3.1 read complete 30 minute database (see note below and 11.2.3);

5.4.3.2 last ‘n’ days of data, where ‘n’ is the number of days (n=0 is the current day);

5.4.3.3 read selected Meters (if appropriate);

5.4.3.4 set time and date;

5.4.3.5 set password;

5.4.3.6 reset MD; and

5.4.3.7 change authentication key at level 2 password access.

Note: The complete 30 minute database can be read by setting "n" (number of days) to a value equal to or greater than the storage capacity of the Meter.

5.5 *Security requirements*: To prevent unauthorised access to the data in the Metering Equipment a security scheme, as defined below, shall be incorporated for both local and remote communications access. Separate security levels shall be provided for the following activities:-

5.5.1 Level 1 - no password to enable read only data specified in 6.4.

5.5.2 Level 2 - password access for:-

5.5.2.1 programming the displays and facilities as defined in displays and facilities;

5.5.2.2 programming the time by communication port access;

5.5.2.3 reprogramming the password for level 2;

5.5.2.4 reading additional information within the Metering Equipment;

5.5.2.5 resetting of the MD if appropriate; and

5.5.2.6 changing the Meter authentication key.

5.5.3 Level 3 - removal of Metering Equipment covers necessitating the breaking of a seal for:

5.5.3.1 calibrating the Metering Equipment; and

5.5.3.2 programming the level 2 password.

In addition to the functions specified for each level it shall be feasible to undertake the functions at the preceding level(s). This need not apply at level 3.

5.6 *Sealing*: All Metering Equipment shall be capable of being sealed in accordance with the Meter Operator Code of Practice.

6. Associated Facilities

6.1 *Interrogation Unit*: The Outstation shall be capable of being interrogated by an Interrogation Unit. The Interrogation Unit may be used for programming, commissioning, maintenance/fault finding and when necessary the retrieval of stored metering data. The data retrieved by the Interrogation Unit shall be compatible with the Data Collector.

Security: The Interrogation Unit shall have a built-in security system, such as a password, so that the Interrogation Unit becomes inoperative and non-interrogatable if it is lost, stolen, etc. The password can be applied at power-on of the device and/or on entry to the Interrogation Unit software application.

6.2 *Additional features*: Additional features may be incorporated within or associated with the Metering Equipment provided but these shall not interfere with or endanger the operation of the Allocation process.

7. Access to Data

7.1 *Access*: Access to metering data shall be in accordance with the provisions of this Agreement including without limitation Schedule 5, Section 13 and the Market Procedures. Such access must not interfere with or endanger the security of the data or the collection process for Allocation purposes

7.2 *Access to data in Outstations*: Access to stored metering data in Outstations shall also be the right of the Responsible Party and any person who has the permission of the Responsible Party.

Appendix 1

8. Outline data structure and formats

8.1 *Appendix 1a*: *Outline data structure*:

The physical definition of the local optical data port is detailed in BS EN 61107. The general protocol specification is as detailed in BS EN 61107, augmented by the specifications contained herein.

The outline data structure described in Appendix 1a is expanded in Appendix 1b to provide more detail of the precise data structures and formats. Appendix 2a contains the data definitions and descriptions. Appendix 2b details the protocol examples to meet the functional requirements of the standard protocol. The data authentication process is outlined in Appendix 3.

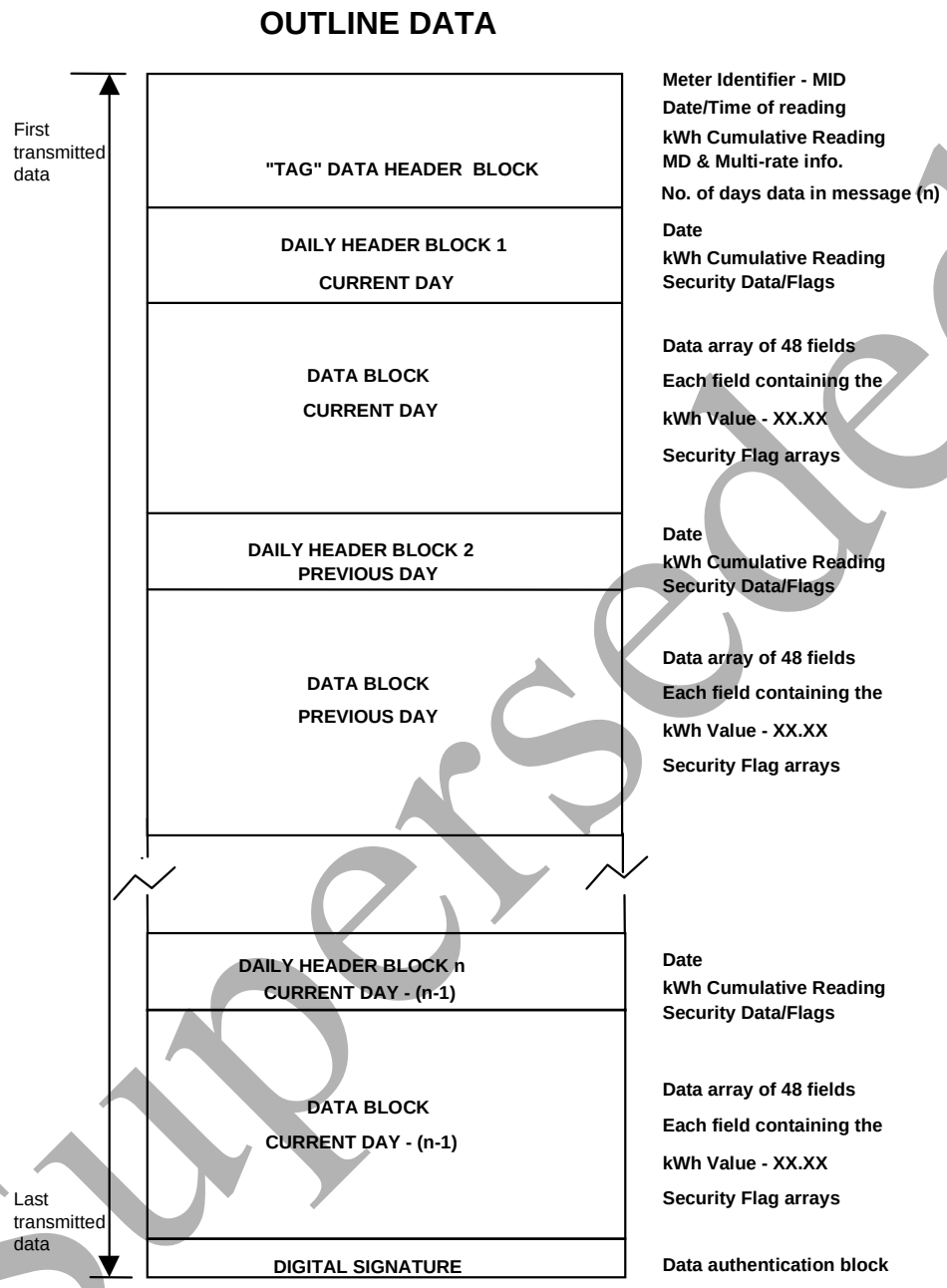
The following guidelines have been established for local communications:

8.1.1 The Outstation transmits complete day information only, i.e. the current day's information is transmitted and "filled" where appropriate, if a period has not yet been completed. "partial days" and "missing days " must be "filled" in the data transmission from the Outstation - see Section 9.1.2;

8.1.2 Chronological inconsistencies in the data block are not allowed. i.e. all data must be contiguous. "partial days" or "missing days " information, (due for example to power outages), must be "filled" in the data block that is transmitted by the Outstation via its local communication port. Data shall be presented as if no Level 2 password access occurred during these periods and no consumption was recorded (i.e. the repetition of the last four digits of the kWh cumulative reading for the appropriate demand periods); and

8.1.3 Data is transmitted in chronological order with current day's partial information transmitted first, oldest day's information transmitted last.

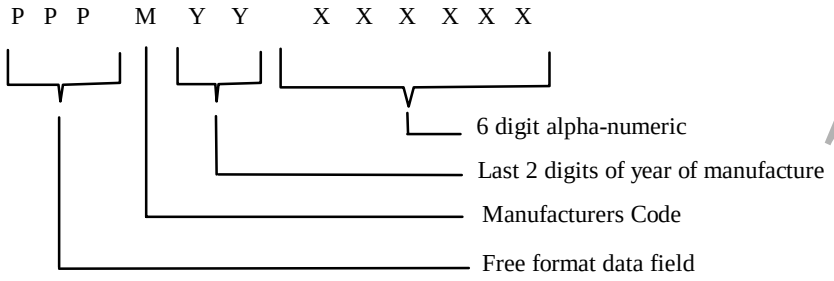
8.2 *Appendix 1b*: *Data structure and formats*:



8.2.1 "TAG" data header block

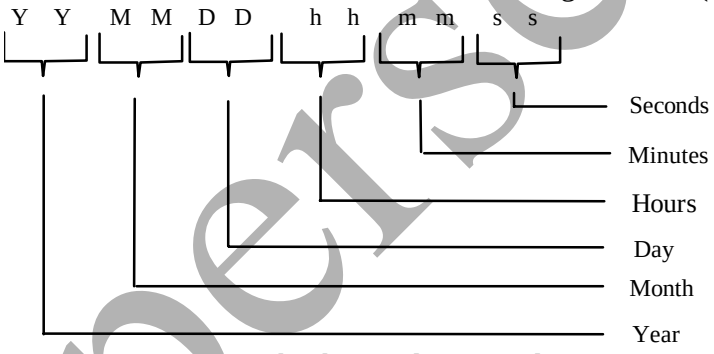
8.2.1.1 Meter Identifier-MID

Character Mapping



Field	Character	Type	Range	Field Padding	Allowed Case
PPP	P	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper or Lower Case
M	M	Alpha	A-Z	-	Upper Case Only
YY	Y	Numeric	0-9	-	-
XXXXXX	X	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper Case Only

8.2.1.2 date and time of reading of Meter (UTC)



8.2.1.3 kWh cumulative reading

The absolute value of the cumulative Meter register at the time of the interrogation. Expressed as:- 6 digit integer kWh value, padded with leading zeroes where appropriate.

1	2	3	4	5	6
Hundred Thousand	Ten Thousand	Thousands	Hundreds	Tens	Units

8.2.1.4 Maximum Demands - MDs

MD register data block consisting of 6 digit (4 integer and two decimal places) kW values with an implied decimal place, padded with leading zeroes where appropriate.

(i) MD in kW in current charging period

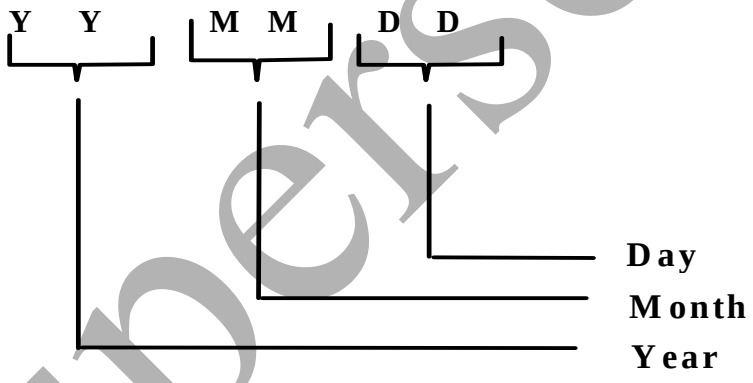
(ii) MD in kW in previous charging period

(iii) Cumulative Maximum Demand

Register ID	1000s	100s	Tens	Units	1/10ths	1/100ths
Current kW MD	1	2	3	4	5	6
Previous kW MD	1	2	3	4	5	6
Cumulative MD	1	2	3	4	5	6

8.2.1.5 Date of last MD reset:

Date of the last MD reset consisting of :-



8.2.1.6 Number of Maximum Demand resets:

The numerical value representing the last two digits of the number of Maximum Demand Resets, rollover to zero after value NN = 99.

No. of MD Resets	N	N

8.2.1.7 Multi-rate energy registers:

Multi-rate energy registers at time of data read out consisting of 6 digit integer kWh values, padded with leading zeroes where appropriate.

Register ID	100ks	10ks	1000s	100s	Tens	Units
Rate 1	1	2	3	4	5	6
Rate 2	1	2	3	4	5	6
Rate 3	1	2	3	4	5	6
Rate 4	1	2	3	4	5	6
Rate 5	1	2	3	4	5	6
Rate 6	1	2	3	4	5	6
Rate 7	1	2	3	4	5	6
Rate 8	1	2	3	4	5	6

This data block should always be of the same size. All data items should be transmitted, even if never initialised or used e.g. MD register on single phase Meter, 8 rate register block even if 4 rate single phase Meter, or if rate currently inactive e.g. due to tariff change.

8.2.1.8 Number of days data in message:

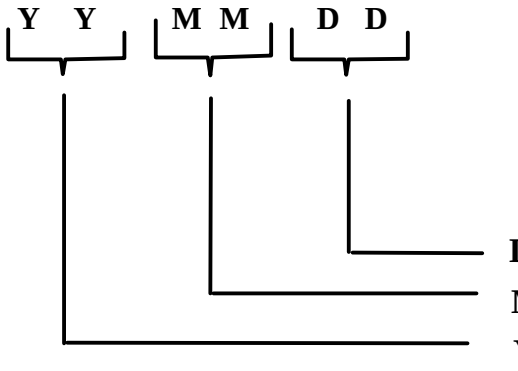
The numerical value representing the number of days of data to be transmitted by the Outstation in response to a request for a data output.

No. of days of data in message	N	N	N

8.2.2 Daily header block:

8.2.2.1 Day identifier:

Day identifier for the 24 hour period to which the 30 minute data relates.



8.2.2.2 Start of day kWh cumulative reading:

The absolute value of the cumulative Meter (channel) register at 00:00 hours, at the start of the 24 hour period, to which the 48 periods of information relate.

Expressed as :- 8 digit kWh value, comprising 6 integers and 2 decimal digits with an implied decimal place, padded with leading zeroes where appropriate.

1	2	3	4	5	6	7	8
Hundred Thousand	Ten Thousand	Thousands	Hundreds	Tens	Units	Tenths	Hundredths

8.2.2.3 Security data and flags:

The normal status of each flag is logic zero and the presence or occurrence of an identified event is signalled by setting the flag to logic 1.

(i) NNN - No. of successful level 2 accesses (maximum count = 7);

(ii) BM - Battery Maintenance Flag;

(iii) CF - Clock Failure;

(iv) MD - MD reset flag, set for the day on which the MD was reset; and

(v) PO - 24 hour continuous power outage of the Outstation.

The security data and flags shall be coded into a single byte as follows:

Bit	7	6	5	4	3	2	1	0
Type	-	PO	MD	CF	BM	N	N	N

(Bit 7 is reserved for future use).

8.2.3 Data block:

The truncated absolute value of the Cumulative Meter (channel) Register at the end of the 30 minute period, to which the value relates. Expressed as :- 4 digit kWh value, comprising two integers and two decimal digits, with an implied decimal place.

1	2	3	4
Tens	Units	Tenths	Hundredths

Appended for each 30 minute record are three security flags:

8.2.3.1 Reverse running indication;

8.2.3.2 Successful level 2 password access; and

8.2.3.3 Power Failure.

The normal status of these flags is logic zero and the presence or occurrence of an identified event is signalled by setting the flag to logic 1.

The data block will consist of a contiguous data array of 48, 4 digit values representing the value (truncated kWh cumulative register) for each respective demand period of the day e.g.

2220 2221 2222 2223 2224 2225 2226 2227
2228 2229 2230 2231 2232 2233 2234 2235
2236 2237 2238 2239 2240 2241 2242 2243
2244 2245 2246 2247 2248 2249 2250 2252
2252 2253 2254 2255 2256 2257 2258 2259
2260 2261 2262 2263 2264 2265 2266 2267

The data flags shall be presented as individual bit arrays with a flag for each demand period of the day in the array (48 bits per day). The sequence and location of individual bits within the data flag array corresponds directly to the demand period number of the respective 30 minute data value. i.e. bit 1 associated with demand period 1 (00:00 to 00:30) bit 48 associated with demand period 48 (23:30 to 24:00).

Data that has not yet been generated for the individual 30 minute demand periods i.e. in current day block for times following the time of data readout, shall be represented by FFFF. All flags for these associated periods shall be set to logic 0.

8.2.4 Data authenticator:

The data authenticator is automatically appended to the data at the end of reading out all the daily data records, resulting from a read 'n' days request. The data authenticator is detailed in Appendix 3.

Appendix 2a

9. Data Definitions and Descriptions

9.1 *Data Block*:

9.1.1 General definition:

Complete set of data for one communications session.

9.1.2 Data definition:

Identifier ::= NamedVariableList

{

variable list name	0
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
list of named variables	8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88

}

9.2 *Meter identifier - MID*:

9.2.1 General definition:

12 characters representing the Meter Identifier - MID.

9.2.2 Data definition:

Identifier ::= NamedVariableObject

{

variable name	8
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	visible-string(SIZE(12))
read-write flag	READ-ONLY
available TRUE	

}

9.3 *Date and time of reading Meter* :

9.3.1 General definition:

12 characters representing the date and time.

9.3.2 Data definition:

DateAndTime ::= NamedVariableObject

{

variable name	16
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	numeric-string(SIZE(12))
read-write flag	READ-ONLY
available TRUE	

}

9.4 *kWh Cumulative Reading*:

9.4.1 General definition:

6 characters representing the total cumulative kWh in kWh.

9.4.2 Data definition:

CumulativekWh ::= NamedVariableObject

{

variable name	24
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	numeric-string(SIZE(6))
read-write flag	READ-ONLY
available TRUE	

}

9.5 *Current kW Maximum Demand*:

9.5.1 General definition:

6 characters representing the current kW MD in 1/100s of a kW.

9.5.2 Data definition:

CurrentkWMD ::= NamedVariableObject

{

variable name	32

scope of access VDE-specific

scope may change FALSE

life time VDE

type description numeric-string(SIZE(6))

read-write flag READ-ONLY

available TRUE

}

9.6 *Previous kW Maximum Demand*:

9.6.1 General definition:

6 characters representing the previous kW MD in 1/100s of a kW.

9.6.2 Data definition:

PreviouskWMD ::= NamedVariableObject

{

variable name 40

scope of access VDE-specific

scope may change FALSE

life time VDE

type description numeric-string(SIZE(6))

read-write flag READ-ONLY

available TRUE

}

9.7 *Cumulative Maximum Demand*:

9.7.1 General definition:

6 characters representing the cumulative MD in 1/100s of a kW.

9.7.2 Data definition:

CumulativeMD ::= NamedVariableObject

{

variable name 48

scope of access VDE-specific

scope may change FALSE

life time VDE

type description numeric-string(SIZE(6))

read-write flag READ-ONLY

available TRUE

}

9.8 *Date of last MD reset*:

9.8.1 General definition:

6 characters representing the date of the last maximum demand reset.

9.8.2 Data definition:

MDResetDate :: = NamedVariableObject

{

variable name 56

scope of access VDE-specific

scope may change FALSE

life time VDE

type description numeric-string(SIZE(6))

read-write flag READ-ONLY

available TRUE

}

9.9 *Number of Maximum Demand resets*:

9.9.1 General Definition:

2 characters representing the number of maximum demand resets, 00 - 99.

9.9.2 Data definition:

NumMaxDemandResets :: = NamedVariableObject

{

variable name 64

scope of access VDE-specific

scope may change FALSE

life time VDE

type description numeric-string(SIZE(2))

read-write flag READ-ONLY

available TRUE

}

9.10 *Multi-rate energy registers*:

9.10.1 General definition:

Eight registers containing the multi-rate kWh energy in kWh.

9.10.2 Data definition:

MultiRatekWh ::= NamedVariableObject

{

variable name	72
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	compact-array (SIZE (8)) OF numeric-string (SIZE (6))
read-write flag	READ-ONLY
available TRUE	

}

9.11 *Number of days data in message*:

9.11.1 General definition:

Three characters representing the number of days of data to be transmitted.

9.11.2 Data definition:

NumberOfDays ::= NamedVariableObject

{

variable name	80
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	numeric-string(SIZE(3))
read-write flag	READ-ONLY
available TRUE	

}

9.12 *Profile data*:

9.12.1 General definition:

Daily data block comprising header data and profile data.

9.12.2 Data definition:

DailyData ::= NamedVariableObject

{

variable name	88
scope of access	VDE-specific
scope may change	FALSE
life time VDE	
type description	array OF DailyDataType SIZE(N)
read-write flag	READ-ONLY
available TRUE	

}

Where N = 20, 100, 250 or 450

DailyDataType :: = structure

{

DayIdentifier	numeric-string(SIZE(6))
StartCumulativekWh	numeric-string(SIZE(8))
DailyFlags	bit-string(SIZE(8))
HalfHourData	compact-array (SIZE (48)) OF numeric-string (SIZE (4))
ReverseRunning	bit-string(SIZE(48))
Level2 bit-string(SIZE(48))	
PowerFail bit-string(SIZE(48))	

}

9.13 *Authenticator*:

9.13.1 General definition:

Eight byte string calculated using an authentication algorithm, an internal 8 byte authentication key and the preceding data.

9.13.2 Data definition:

Authenticator ::= NamedVariableObject

{

variable name	96
scope of access	VDE-specific

scope may change FALSE

life time VDE

type description octet-string(SIZE(8))

read-write flag READ-ONLY

available TRUE

}

9.14 *Authentication Key*:

9.14.1 General definition:

Eight byte string used by the authentication algorithm when calculating the authenticator.

9.14.2 Data definition:

AuthenticationKey ::= NamedVariableObject

{

variable name 104

scope of access VAA-specific

VAA name 39 -- VAAManagement

scope may change FALSE

life time VDE

type description octet-string(SIZE(8))

read-write flag WRITE-ONLY

available TRUE

}

9.15 *Password*:

9.15.1 General definition:

Six character string consisting of case sensitive alpha characters (A to Z), digits (0 to 9) or the underscore character (_).

9.15.2 Data definition:

Level2Password ::= NamedVariableObject

{

variable name 112

scope of access VAA-specific

VAA name 39 -- VAAManagement

scope may change FALSE

life time VDE

type description visible-string(SIZE(6))

read-write flag WRITE-ONLY

available TRUE

}

9.16 *Date and time set*:

9.16.1 General definition:

12 characters representing the date and time.

9.16.2 Data definition:

DateAndTimeSet ::= NamedVariableObject

{

variable name 120

scope of access VAA-specific

VAA name 39 -- VAAManagement

scope may change FALSE

life time VDE

type description numeric-string(SIZE(12))

read-write flag READ-WRITE

available TRUE

}

9.17 *Time adjust*:

9.17.1 General definition:

Signed integer representing the number of seconds by which to adjust the time. The maximum permissible value is ± 900 seconds.

9.17.2 Data definition:

DateAndTimeSet ::= NamedVariableObject

{

variable name 128

scope of access VAA-specific

VAA name 39 -- VAAManagement

scope may change	FALSE
life time	VDE
type description	integer16
read-write flag	WRITE-ONLY
available	TRUE

}

9.18 *Maximum Demand reset*:

9.18.1 General definition:

Boolean which when written to will initiate a maximum demand reset.

9.18.2 Data definition:

MDReset ::= NamedVariableObject

{

variable name	136
scope of access	VAA-specific
VAA name	39 -- VAAManagement
scope may change	FALSE
life time	VDE
type description	integer8
read-write flag	WRITE-ONLY
available	TRUE

}

9.19 *Free format field of Meter identifier*:

9.19.1 General definition:

3 characters representing the free format field section of the Meter Identifier.

9.19.2 Data definition:

Identifier ::= NamedVariableObject

{

variable name	144
scope of access	VAA-specific
VAA name	39 -- VAAManagement

scope may change FALSE

life time VDE

type description visible-string(SIZE(3))

read-write flag READ-WRITE

available TRUE

}

9.20 *Metering Code of Practice S6 identifier*:

9.20.1 General definition:

An eleven character string identifying the issue number of this Code.

Writing to this variable will invoke manufacturer specific features.

9.20.2 Data definition:

Identifier::= NamedVariableObject

{

variable name 65528

scope of access VAA-specific

VAA name 39 -- VAAManagement

scope may change FALSE

life time VDE

type description visible-string(SIZE(11))

read-write flag READ-WRITE

available TRUE

}

Appendix 2b

10. Protocol examples

10.1 *Introduction*: This appendix defines how the BS EN 61107 protocol is used to transfer the DLMS named variables and named variable list specified in Appendix 2a. This appendix also defines how the data within each named variable is encoded into a sequence of bytes according to the DLMS definitions, ASN.1 type definitions and the A-XDR encoding rule.

Some of the named variables in appendix 2a are not individually readable, but are readable via the data block named variable list. This appendix identifies which named variables are readable.

10.2 *BS EN 61107*: This section defines how the read, write and password commands of BS EN 61107 mode C are used to access named variables

10.2.1 Read selected Meters:

This is implemented via the multi-drop option of BS EN 61107. Where more than one Meter is connected to the same serial port it is necessary to include a device identifier in the initial sign-on string.

/?<Optional device identifier>!<CR><LF>

The device identifier can be up to 16 characters.

10.2.2 Password security:

To achieve level 2 security an BS EN 61107 P1 command must be sent to the Meter. The P1 command should contain the 6 character password.

e.g.

<SOH> P 1 <STX> (123456) <ETX> <

C>

for a password of "123456".

Spaces in the above example are purely to aid readability and are not transmitted.

10.2.3 Reads:

For reads of the named variables a BS EN 61107 read command will be used. The partial block command type R3 will be used to read named variable zero (Data Block). Command type R1 will be used for all other reads.

To avoid conflicts with manufacturer specific addresses (used for communications outside the scope of this Code), each manufacturer will implement a method of switching to manufacturer specific operation, whereby the same address may be used for other purposes.

The method for switching to manufacturer specific operation is to write to the "Metering Code of Practice S6 Identifier" named variable 65528. The Meter must return to supporting the functionality and addresses specified in this document following a BS EN 61107 sign on.

The address field within the read commands will be used to hold the variable name. This variable name is passed as a 4 digit hex number, e.g. password = 112, has the hex address of 0070.

The length field within the read commands will be unused and set to zero, except when reading the data block named variable.

When reading the data block named variable the length field of the read request identifies the number of days worth of data to return. If the number of days requested exceeds the quantity of days stored in the Meter then the Meter returns all of the days data it has stored. This provides a mechanism for reading all the available days' data in the Meter. Reading zero days' worth of data shall result in the Meter returning the authenticated tag

data header block only, including a zero in the tag data header file "Number of days data in message".

Below is a summary of the named variables available for reading directly, their variable name, and whether level 2 security is needed to access them.

Variable	Name	Access commands	level 2 security ?
Data Block	0	R3	no
Authentication Key	104	W1	yes
Password	112	W1	yes
Date and Time Set	120	R1, W1	yes for W1
Time Adjust	128	W1	yes
Maximum Demand Reset	136	W1	yes
Free format field of Meter ID (PPP)	144	R1, W1	yes
MCOP6 Identifier	65528	R1, W1	no/no

10.2.4 Writes:

Write to named variables shall be performed using the BS EN 61107 W1 command. As for the read command the address field of the command is used to pass the variable name.

All writes to the Meter, except writes to the Metering Code of Practice S6 Identifier, require level 2 security as defined in the table above. Writes to the Metering Code of Practice S6 Identifier do not modify data at this level but invoke manufacturer specific addressing modes.

10.3 *Read data block*: The read command to fetch the data block variable is as follows :-

<SOH> R3 <STX> 0000 (*nnnn*) <ETX> <BCC>

where *nnnn* has values zero to FFFF hex identifying the number of days worth of data required including the current day. *nnnn* is expressed as a 4 digit hex number.

The data will be passed back to the Meter in many BS EN 61107 data messages, using partial block transfer. Each block does NOT necessarily relate to a specific day.

The address field in the data messages used to transfer the data shall be zero for the first message and increment for each following message.

The data is transmitted with the most recent data first.

All data specified in Appendix 1 except the half hour data flags, shall be transmitted unchanged since it contains only printable ASCII characters which can be transmitted using BS EN 61107. The half hour data flags specified in Appendix 1, shall be converted to ASCII hex character pairs before transmission, with the most significant nibble first.

The half hour data flags which consist of arrays of 48 bit flags are transmitted as a sequence of 12 ASCII hexadecimal characters, where the first hex character transmitted holds the bit flags for the first four integration periods in the day, and within each hex character the most significant bit represents the earliest bit flag and the least significant bit represents the latest bit flag. Hence the bit flag for 00:00 to 00:30 is transmitted in the most significant bit of the first hexadecimal character transmitted, and the bit flag for 23:30 to 24:00 is transmitted in the least significant bit of the twelfth character.

The response to the BS EN 61107 read command is a sequence of data messages as follows:-

<STX>0000(meter identifier.....)<EOT><BCC>

<STX>0001(.....)<EOT><BCC>

<STX>xxxx(.....)<ETX><BCC>

The format of the data transferred is described below. Before each set of data characters is an explanation of the data source.

Text in italics represent fields to be replaced by data values. Only these fields are transmitted, the (DLMS packaging) characters in normal text are not transmitted. The format of the fields is as defined in Appendix 1 unless stated otherwise.

Read named variable list zero is returning	
twelve variables	000C
Variable read request successful	00
Data type = visible-string	0A
Identifier	*meter identifier* (12 characters)
Variable read request successful	00
Data type = visible-string	0A
DateAndTime of reading	*date and time of reading* (12 characters)
Variable read request successful	00
Data type = visible-string	0A
CumulativekWh	*cumulative kWh* (6 characters)
Variable read request successful	00
Data type = visible-string	0A

CurrentkWMD	*current kW maximum demand* (6 characters)
Variable read request successful	00
Data type = visible-string	0A
PreviouskWMD	*previous kW maximum demand* (6 characters)
Variable read request successful	00
Data type = visible-string	0A
CumulativeMD	*cumulative maximum demand* (6 characters)
Variable read request successful	00
Data type = visible-string	0A
MDResetDate	*date of last MD reset* (6 characters)
Variable read request successful	00
Data type = visible-string	0A
NumMaxDemandResets	*number of MD resets* (2 characters)
Variable read request successful	00
Data type = compact-array	13
Array element type - visible-string	0A
MultiRatekWh	*eight rate kWh registers* (48 characters = 8x6)

Variable read request successful	00
Data type = visible-string	0A
NumberOfDays	*number of days' worth of data* (3 characters)
Variable read request successful	00
Data type = array	01
Number of elements of array	*number of days' worth of data expressed as a 4 digit ASCII hex number (zero upwards).*

Then the following is repeated for each days worth of data :-

Structure	02
Number of items in structure	07
Data type = visible string	0A
DayIdentifier	*day identifier YYMMDD* (6 characters)
Data type = visible string	0A
StartCumulativeDWh	*start of day cumulative DWh* (8 characters)
Data type = Bit string	04
DailyFlags	*daily security data and flags expressed as a two digit ASCII hex number.*

Data type = compact array	13
Array element type = visible string	0A
HalfHourData	*forty eight truncated cumulative energy register values of four characters each* (192 characters)
Data type = bit array	04
ReverseRunning	*forty eight reverse running bit flags expressed as a twelve digit ASCII hex number* (12 characters)
Data type = bit array	04
Level2	*forty eight level 2 access bit flags expressed as a twelve digit ASCII hex number* (12 characters)
Data type = bit array	04
PowerFail	*forty eight power failure bit flags expressed as a twelve digit ASCII hex number* (12 characters)

Finally:-

Variable read request successful	00
Data type = visible string	0A
Authenticator	authenticator expressed as a sixteen digit ASCII hex number

10.4 *Authenticator*: The purpose of the authenticator is to verify the origin and authenticity of data retrieved from the Meter.

An authenticator is automatically provided at the end of the sequence of reading "n" days Meter reading records. On receipt of the request to read "n" days records, the data authenticator seed is automatically reset (set to 0) by the Meter. Once the last day's data has been transmitted, the resultant authenticator is then transmitted.

No direct access is provided for writing the seed or reading the authenticator.

A description of how the authenticator is calculated is defined in Appendix 3.

10.5 *Authentication key*: Assuming level 2 access has been granted, the level authentication key is set by writing to variable 104 as defined in Appendix 2a.

The authentication key is defined as an eight byte binary number which is transferred as a sixteen character ASCII HEX value.

e.g. To set the authentication key to 0123456789ABCDEF hexadecimal

To Meter <SOH> W 1 <STX> 0068 (0123456789ABCDEF) <ETX><BCC>

From Meter <ACK>

10.6 *Set Password*: Assuming level 2 access has been granted, the level 2 password is set by writing to variable 112 as defined in Appendix 2a.

e.g. To set the password to "ABC123"

To Meter <SOH> W 1 <STX> 0070 (ABC123) <ETX> <BCC>

From Meter <ACK>

10.7 *Time And Date*: Assuming level 2 access has been granted, the date and time is set by writing to variable 120 as defined in Appendix 2a.

e.g. To set the date and time to 18 December 1995 09:25:00

To Meter <SOH>W1<STX>0078(951218092500)<ETX><BCC>

From Meter <ACK>

To read the date and time, Level 2 access is not required and it can be retrieved by reading named variable 120.

e.g.

To Meter <SOH>R1<STX>0078(0)<ETX><BCC>

From Meter <STX>0078(951218092500)<ETX><BCC>

Where the date and time is 18th December 1995 at 09:25:00.

10.8 *Time Adjust*: The time in the Meter can be adjusted by a specified number of seconds by writing to variable 128 as defined in Appendix 2a. This method of clock synchronisation must never introduce or skip integration periods, i.e. it must guarantee that there are always 48 integration periods in a day.

The data passed in the write command represents the number of seconds to advance or retard the Meter's clock by and is a signed integer of length two bytes which is encoded as a four character ASCII HEX number.

e.g. To advance the clock by 12 seconds

To Meter <SOH> W1 <STX> 0080 (000C) <ETX> <BCC>

From Meter <ACK>

e.g. To retard the clock by 12 seconds

To Meter <SOH> W1 <STX> 0080 (FFF4) <ETX> <BCC>

From Meter <ACK>

Where 0xFFF4 is the two's complement of 0x000C.

10.9 *Reset MD*: Assuming level 2 access has been granted, a maximum demand reset can be initiated by writing one character (any value) to variable 136 as defined in Appendix 2a.

e.g.

To Meter <SOH> W1 <STX> 0088 (0) <ETX> <BCC>

From Meter <ACK>

10.10 *Free format field of Meter ID (ppp)*:

Assuming Level 2 access has been granted, the free format part of the Meter ID can be written to by writing to a named variable 144 as defined in Appendix 2a.

e.g. To set the value "ABC"

To Meter <SOH>W1<STX>008C(ABC)<ETX><BCC>

From Meter <ACK>

10.11 *Metering Code of Practice S6 Identifier*:

Named variable 65528 can be read to determine the Issue of Code of Practice Six supported by the Meter. The format of the response is fixed as "COP6I300^^^", where "^" represents a space character and "I300" represents Issue 3.00 of Code of Practice Six.

e.g.

To Meter <SOH>R1<STX>FFF8(0)<ETX><BCC>

From Meter <STX>FFF8(COP6I300^^^)<ETX><BCC>

Writing to this address invokes manufacturer specific addressing modes.

Appendix 3

11. Authentication

11.1 *Authentication overview*: The purpose of authentication is to ensure that the receiver of the information can be confident that the contents of the message have not been altered since it left the sender and that the identity of the sender is not misrepresented.

The data authentication process uses a system whereby an authentication key will be loaded into Outstations by authorised parties. This authentication key will then be used to form an authenticator on all the data to be communicated. The same authentication key will be provided to the authenticating parties. This will ensure that all authorised holders of the authentication key will be able to validate the authenticity of the information being transferred, provided of course that they also have knowledge of the authentication algorithm and its method of use.

The authentication key programmed into Outstations and other validation equipment can be changed should the authentication system be compromised by disclosure or discovery of the key.

A key management system is required to ensure secure creation, storage and distribution of the authentication key to all parties concerned. This system is outside the scope of this document.

Different authentication keys may be used for various Outstations or groups of Outstations if required. However, this will require a more complex key management system to be used, and knowledge of a number of authentication keys from which the appropriate one must be selected, by the authenticating party.

11.2 *Authentication process*: The complete data block described in Appendix 1(a) will be signed by an authenticator to provide authentication of the source and validation of the data. This allows the content of the message

to be sent in plain text and still to be validated and authenticated by authorised parties only.

There are four elements used in the calculation of the Authenticator. These are:

11.2.1 the authentication key;

11.2.2 the authentication algorithm;

11.2.3 the data block; and

11.2.4 the method by which (a) and (b) above operate on the contents of the data block to create the authenticator.

The authentication key is an 8 byte binary number (56 bits of key data and 8 bits of parity) that is kept secret. It is placed only in those devices that need either to generate an authenticator, or to check that the authenticator received is valid.

The algorithm used in the calculation of the authenticator is the data encryption standard (DES). This is a publicly available secret key block encryption algorithm, detailed in the following Standard: ANSI X3.92-1981.

The Data Block for authentication is detailed in Appendix 1(a). All the data in the total Data Block, consisting of the data in the Tag Header Block and the data for each of the days of daily data transmitted, are included in the authenticator calculation. A change to any item of data in the Data Block affects the authenticator.

The method by which the authenticator is calculated, (using the authentication key, DES, and the data in the Data Block) is detailed in a controlled document, available on request to authorised parties from the Balancing and Settlement Code Company. However, the security of Authentication depends essentially on the security of the key, not on the security of the controlled document.

Appendix 4

12. Authenticator calculation

12.1 *This Appendix 4*: Authenticator calculation is a controlled document, available on request to authorised parties from Scottish Settlements.

Appendix 5

13. Multi-rate Register Switching Regime

Multi-rate registers shall be programmable to provide the following minimum seasonal time of use tariff switching regime as described below and in the following diagrams:

13.1 A minimum of 24 stored register switching times for a single phase and 48 for polyphase Meter systems at any one time.

13.2 A minimum of 8 day types, each of which has an individual set of register switching times.

13.3 A sequential day of the week number to allow register switching to take place on any day of the week or combinations of days of the week. Monday shall be day 1.

13.4 A minimum of 8 seasons. Different weekday or combinations of weekdays register switching time registers can apply to each season.

13.5 In addition to switching times a minimum of 13 MD Reset dates, commencing at the start of the settlement day, for the start of the seasons.

13.6 A minimum of 2 daylight clock time changes, indicated by date and month during which a time shift of 1 or 2 hours will be implemented at 02:00 (time advance) or 03:00 (time retard). This shall not effect the UTC clock.

13.7 A minimum of 12 exclusion dates during which any day's register switching times, indicated by day type, can be implemented for each exclusion date.

13.8 Where Maximum Demand (MD) metering is being operated the MD shall be programmable to reset automatically as defined by 13 MD reset dates.

Where load switching is provided it shall comply with the appropriate standards.

Trigger Dates For Start of Seasons

1	DDMM	Sn
2	DDMM	Sn
3	DDMM	Sn
4	DDMM	Sn
5	DDMM	Sn
6	DDMM	Sn
7	DDMM	Sn
8	DDMM	Sn
9	DDMM	Sn
10	DDMM	Sn
11	DDMM	Sn
12	DDMM	Sn
13	DDMM	Sn

Sn = 1 to 8

Season Definitions

Season No. Sn	Day of Week/Day Type - DT						
	M	Tu	W	Th	F	S	Su
S1	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S2	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S3	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S4	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S5	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S6	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S7	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n
S8	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n	DT_n

DTn = 1 to 8

Day Type/Tariff Switching

Day Type -DTn

DT1 | DT2 | DT3 | DT4 | DT5 | DT6 | DT7 | DT8

HHMM | R_n ——— HHMM | R_n

HHMM | R_n ——— HHMM | R_n

Time/Register No. Matrix

Single phase = 24 Time/Register No. slots

Polyphase = 48 Time/Register No. slots

Rn = 1 to 4 for single phase
Rn = 1 to 8 for polyphase

Exclusion Dates

1	DDMM	DT
2	DDMM	DT
3	DDMM	DT
4	DDMM	DT
5	DDMM	DT
6	DDMM	DT
7	DDMM	DT
8	DDMM	DT
9	DDMM	DT
10	DDMM	DT
11	DDMM	DT
12	DDMM	DT

Date of MD Reset

1	DDMM
2	DDMM
3	DDMM
4	DDMM
5	DDMM
6	DDMM
7	DDMM
8	DDMM
9	DDMM
10	DDMM
11	DDMM
12	DDMM
13	DDMM

Daylight Saving Clock Changes

DDMM	+H

advance tariff clock at 0100 hours UTC by 'H' hours on date specified

DDMM	-H

retard tariff clock at 0100 hours UTC by 'H' hours on date specified

Note - Valid range of 'H' is either 1 or 2.

Appendix 6

Generic Derogations

No generic Derogation applicable to this Code.

Appendix 7

Definitions

"Accredited Laboratory"	means the National Physical Laboratory (NPL), or a calibration laboratory that has been accredited by the National Measurement Accreditation Service (NAMAS), or an international laboratory recognised by NPL for the measurement required, or any other laboratory approved by the Director;
"Act"	means the Electricity Act 1989;
"Active Energy"	means the electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt-hours (Wh) and standard multiples thereof, that is 1,000 Wh = 1 kilowatt-hour (kWh) 1,000 kWh = 1 megawatt-hour (MWh) 1,000 MWh = 1 gigawatt-hour (GWh) 1,000 GWh = 1 terawatt-hour (TWh);
"Actual Metering Point"	means the physical location at which energy is metered;
"Agent"	means any person acting on behalf of a principal in performance of obligations incumbent upon a Party or Distributor in terms of this Agreement;
"Agreement"	means this Agreement (including the Recitals and the Schedules) as amended, varied, supplemented, modified or

	suspended from time to time in accordance with the terms hereof;
"Allocation"	means the operation of the Central Allocation System;
"Amps"	means amperes;
"Associated Responsible Party"	means the Responsible Party which appointed the relevant Agent;
"Balancing and Settlement Code"	means the Agreement of that name between NGC and others to be entered into or entered into in part implement of the reforms of the Electricity Market in England and Wales permitting physical bi-lateral contracts to be entered into between Generators and Suppliers;
"Balancing and Settlement Code Company"	means Elexon Limited (registered number 03782949) a company registered in England and Wales having its registered office at 3rd Floor, 15 Marylebone Road, London NW1 5JD;
"Bulk Supply Point" or "BSP"	means a point of supply from a Transmission System to a:- (i) Distribution System; or (ii) Exempt Distribution System; or (iii) Grid-connected Composite Site; or (iv) Grid-connected Customer Site;
"Certification Regulations "	means S1792 The Meters (Certification) Regulations 1990;
"Code of Practice"	means each of the codes of practice in force in England and Wales in relation to any Metering Equipment or any part or class thereof;

"Composite Site"	means a Grid-connected Generation Site or Embedded Generation Site at which a Generator Party or Non Trading Generator:- (i) exports Active Energy to a Distribution System or a Transmission System; and (ii) imports Active Energy from a Distribution System or a Transmission System for purposes other than the generation of electrical energy;
"Co-ordinated Universal Time" or "UTC"	has the same meaning as in the document Standard Frequency and Time Signal Emission, International Telecommunication Union (CRTF.4609ISBN92-61-05311-4);
"Cumulative Reading"	means a record of the value indicated by the Cumulative Register at a given point in time;
"Customer"	means any person supplied or requiring to be supplied with electricity at premises within the BSP Group of Scottish Hydro-Electric or ScottishPower other than a person supplied or requiring to be supplied with electricity at a Power Station (save where such supply is to a Grid-connected Power Station connected to the Transmission System of one Host Company but with an auxiliary supply connected to a Distribution System in the other Host Company's BSP Group) or any

	person transferring electricity to or from ScottishPower's or Scottish Hydro-Electric's BSP Group (as appropriate) across an interconnector, in its capacity as such;
"Data Aggregation"	means the process of aggregating consumption figures received from Data Collectors;
"Data Collection"	means the retrieval, validation and processing of metering data;
"Data Collector"	means an Accredited person appointed by a Supplier, Generator Party or Host Company pursuant to Clause 25.1, Clause 39.1 or Clause 54.1, as the case may be, for the purposes of this Agreement;
"Defined Metering Point" or "DMP"	means the physical location at which the overall accuracy requirements are to be met, such physical location and accuracy requirements being as stated in the Metering Codes of Practice;
"Demand Period"	means the period over which Active Energy, Reactive Energy or Apparent Energy are integrated to produce Demand Values for Allocation purposes and unless the context otherwise requires, each Demand Period shall be of thirty (30) minutes duration one of which will finish at 2400 hours;
"Demand Value"	means, expressed in kW, kvar, kVA, twice the value of kWh, kvarh or kVAh recorded during any Demand Period, the Demand Values are Half Hour Demands

	identified by the end of the Demand Period;
"Derogation"	means a derogation given in terms of Clause 93 (Derogations);
"Distribution Licence"	means a Distribution Licence granted, (or to be treated as granted) under Section 6(1)(c) of the Act;
"Distribution System"	means a system for the distribution of electrical energy as defined in the Distribution Licence of the ScottishPower Distribution Undertaking, the Scottish and Southern Energy Distribution Undertaking or any Distributor;
"Embedded"	means solely connected to a Distribution System or an Exempt Distribution System, such connection being either a direct connection or a connection via a busbar of another User;
"Export"	means:- (i) a flow of Active Energy from a Generation Site onto the Distribution System or Transmission System; or (ii) a flow of Active Energy from a BSP onto the Transmission System; or (iii) a flow of Active Energy out of Scotland despatched by ScottishPower's Grid Control Centre and "Exported" shall be construed accordingly;

"Generation Site"	means any Grid-connected or Embedded Power Station or any Grid-connected or Embedded Composite Site as the case may be;
"Generator Agent"	means any Meter Operator or Data Collector appointed by a Generator Party pursuant to Clause 54.1 (Appointment of Generation Agents);
"Grid-Connected"	means directly connected to a Transmission System;
"GWh"	means gigawatt hours;
"Identifier" or "Id"	means a unique number and/or letter or, as the case may be, a unique combination of numbers and/or letters;
"Import"	means:- (i) a flow of Active Energy to a Generation Site from the Distribution System or Transmission System; or (ii) a flow of Active Energy to a BSP from the Transmission System; or (iii) a flow of Active Energy into Scotland despatched by ScottishPower's Grid Control Centre and "Imported" shall be construed accordingly;
"Interrogation Unit"	means a portable computer used by Data Collectors to extract and store information from the Outstations;
"kVA"	means kilovoltamperes;
"kVAh"	means kilovoltampere hours;

"kvar"	means kilovoltamperes reactive;
"kvarh"	means kilovoltamperes reactive hours;
"kW"	means kilowatts;
"kWh"	means kilowatt hours;
"Market Auditor"	means that person or persons appointed by Scottish Settlements to audit the operation of the market pursuant to Schedule 6 (Role of the Market Auditor);
"Market Procedure"	means each of the market procedures set out in Schedules 14 (Market Procedures for General Allocation) to 18 (Market Procedure for Accreditation and Certification) as amended, varied, supplemented, modified or suspended from time to time in accordance with the terms of this Agreement;
"Maximum Demand"	means the greatest of the Demand Values recorded during a given Meter Advance Period by Metering Equipment capable of recording Demand Values in each of the Half Hours of such charging period as may be identified by a Responsible Party;
"Meter"	means a device for measuring Active Energy and/or Reactive Energy;
"Meter Operator"	means a person Accredited to install, commission, maintain and energise Metering Equipment and "Meter Operation" shall be construed accordingly;
"Meter Operator Code of Practice"	means Schedule 5 to the Agreement between Meter Operators and Distribution Businesses governing arrangements for

safety and technical competence;

"Meter Register" means a physical device for measuring Active Energy or Reactive Energy;

"Metering Code of Practice" means each of the Scottish codes of practice relating to metering contained in Schedule 19 (Metering Codes of Practice) as amended, varied, supplemented, modified or suspended from time to time in accordance with the terms of this Agreement;

"Metering Equipment" means Meters and, where relevant, measurement transformers (voltage, current or combination units) metering protection equipment including alarms, circuitry, their associated communications equipment and Outstations, and wiring which are part of the Active Energy and/or Reactive Energy measuring and transmitting equipment for Allocation under this Agreement;

"Metering Point" means the point, determined according to the principles and guidance given at Schedule 9 to the Master Registration Agreement at which a supply (import) from a Distribution System and/or a Transmission System:-

(i) is or is intended to be measured; or

(ii) where Metering Equipment has been removed, was or was intended to be measured; or

(iii) in the case of an Unmetered

Supply, is deemed to be measured under the relevant Market Procedure(s) including MP-520,

where in each case such measurement is for the purposes of ascertaining the volumes allocated to that Supplier under this Agreement;

"Metering System" means:-

(i) in the case of a metering system at a Bulk Supply Point, Power Station, or Composite Site (but always excluding metering systems at a Composite Site which comprise an Import Register and no Export Register), physically distinct and related Commissioned Metering Equipment at or relating to a Site which measures a trade in Active and/or Reactive Energy where the Active Energy is allocated in accordance with the Rules; or

(ii) in the case of any other metering system and, where the context requires, metering systems at Composite Sites comprising a Settlement Register, a Metering Point;

"MVA" means megavoltamperes;

"MW" means Megawatts;

"MWh" means Megawatt hours;

"Outstation" means equipment which receives and

	stores data from a Meter for the purpose, *inter alia*, of transfer of that metering data to a Data Collector and which may perform some processing before such transfer. This equipment may be in one or more separate units or may be integral with the Meter;
"Party"	means each person for the time being party to this Agreement whether as a Founder Signatory or pursuant to an Accession Agreement and shall include any successor(s) in title to or permitted assignee(s) of such person, but always excluding a Non Trading Generator and a Distributor unless expressly otherwise provided;
"Performance Assurance and Accreditation Panel"	means the body established pursuant to Clause 84.1;
"Pool"	means the electricity pool of England and Wales set up under the Pooling and Settlement Agreement as now succeeded by the trading arrangements established pursuant to the Balancing and Settlement Code;
"Power Station"	means an installation comprising one or more generating units (even where sited separately) (other than a Composite Site), owned and/or controlled by the same Generator Party or Non Trading Generator which may reasonably be considered as being managed as one power station;

"Public Electricity Supplier" or "PES"	means the ScottishPower Distribution Undertaking or the ScottishPower Supply Undertaking or the Scottish and Southern Energy Distribution Undertaking or the Scottish and Southern Energy Supply Undertaking as the case may be as specified in Schedule 3A (ScottishPower Transfer Scheme) or Schedule 3B (Scottish and Southern Energy Transfer Scheme);
"Rated Measurement Current"	means the rated primary current of the current transformers in primary plant used for the purpose of measurement;
"Reactive Energy"	means the integral with respect to time of the Reactive Power;
"Reasonable and Prudent Operator"	means a person exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances;
"Reconciliation Run"	means any second or subsequent run of the Central Allocation System carried out by the Operating Agent for a Trading Day;
"Reference Standard"	means a standard whose measurement traceability to National Standards has been verified either at an Accredited Laboratory or is directly maintained by radio communication;
"Reference Temperature"	means a stated temperature for any

apparatus at which that apparatus has a known specification. If no temperature is stated the Reference Temperature is 23°C;

"Responsible Party" means:-

(i) a Supplier in relation to a Metering System which is registered to that Supplier in the relevant PES Registration Service (and for the avoidance of doubt shall include any Metering System at any Grid-connected Customer Site, or Grid-connected Composite Site, so registered); or

(ii) each Transmission Business in relation to a Metering System at a Bulk Supply Point which is registered in the relevant Bulk Supply Point Registration Service (which, for the avoidance of doubt, shall not include any Metering System at a Grid-connected Customer Site or at a Grid-connected Composite Site); or

(iii) a Generator Party in relation to a Metering System at a Registrable Generation Site which is registered to that Generator Party in the relevant Generation Registration Service (with the exception of any Metering System at such Registrable Generation

	Site which is a Composite Site and which comprises an Import Register or Import Registers), or a Metering System comprising a Registrable Import Register registered to it in the relevant Grid-connected Power Station (Import Registers) Registration Service;
"Scottish Company"	means Scottish Hydro-Electric or ScottishPower, as appropriate and Scottish Companies means both of them;
"ScottishPower Distribution Undertaking"	shall have the meaning given to the phrase "Distribution Undertaking" in the ScottishPower Transfer Scheme;
"ScottishPower Supply Undertaking"	shall have the meaning given to the phrase "Supply Undertaking" in the ScottishPower Transfer Scheme;
"ScottishPower Transmission Undertaking"	shall have the meaning given to the phrase "Transmission Undertaking" in the ScottishPower Transfer Scheme;
"Scottish and Southern Energy Distribution Undertaking"	shall have the meaning given to the phrase "Distribution Undertaking" in the Scottish and Southern Energy Transfer Scheme;
"Scottish and Southern Energy Supply Undertaking"	shall have the meaning given to the phrase "Supply Undertaking" in the Scottish and Southern Energy Transfer Scheme;
"Scottish and Southern Energy Transmission Undertaking"	shall have the meaning given to the phrase "Transmission Undertaking" in the Scottish and Southern Energy Transfer

	Scheme;
"Scottish Settlements"	means Scottish Electricity Settlements Limited (registered number SC 169212) a company registered in Scotland having its registered office at Delta House, 50 West Nile Street, Glasgow, G1 2NQ or such other person as is appointed as a successor to Scottish Electricity Settlements Limited in terms of Clause 13 (Appointment of successor to Scottish Settlements);
"Settlement Date"	means the calendar date of a specific Settlement Day;
"Settlement Day" or "Trading Day"	means the period beginning on the spot time of 00.00 and ending with, but not including, the spot time of 24.00, during which Active Energy is traded at any time from and after the Effective Trading Date for a BSP Group;
"Settlement Instation"	means a computer based system which collects or receives data on a routine basis from selected Outstation systems on behalf of any Party, Distributor or their Agents;

"Site"	means:- (i) a Transmission System Entry Point or Exit Point; or (ii) a Distribution System Entry Point or Exit Point or a Bulk Supply Point; (iii) the point of connection of an Exempt Distribution System or a Customer to a Distribution System or a Transmission System; and (iv) the point of connection of two Distribution Systems;
"Standard(s)"	means any of the following: Reference Standards; AC/DC Transfer Standards; AC Transfer Standards; or Working Standards, as the context so requires;
"Supplier"	means a Party which:- (i) is a Founder Supplier; (ii) is a supplier with an exemption under the Act; (iii) is a Second Tier Supplier and who was admitted as a Party in the capacity of a Supplier; or (iv) in accordance with Clause 6.8 has changed capacity such that it participates as a Party in the capacity of a Supplier ;
"Supplier Agent"	means any Meter Operator, Data Collector, Data Aggregator or Radio Teleswitch Service Access Provider appointed by a Supplier pursuant to Clause 39.1;

"System Data Provision Service"	means the system data provision service to be provided pursuant to Clause 21 (Registration Services, System Data Provision Service and Grid Control Centres);
"Transfer Standard"	means AC/DC Transfer Standard and AC Transfer Standard;
"Transmission System"	means the system for the transmission of electricity as defined in the Transmission Licences of ScottishPower Transmission Undertaking, Scottish and Southern Energy Transmission Undertaking, NGC or, in the case of NIE, the Transmission Licence granted to NIE pursuant to the Electricity (Northern Ireland) Order 1992;
"UTC"	means Co-ordinated Universal Time;
"Working Day" or "Business Day"	has the meaning given to that term in Section 64 of the Act when used in relation to England and Wales;
"Working Standard"	means a standard, including a complete Meter testing system, which has been verified by comparison to either a Reference Standard or a Transfer Standard, and is used for the calibration and testing of Metering Equipment;