Schedule 19
Chapter 7
Metering Code of Practice S7
Code for the Metering of Energy Imports
via Low Voltage Circuits at 100 AMPS
or less per phase for Allocation purposes
Issue 1

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CODE FOR THE METERING OF ENERGY IMPORTS VIA LOW VOLTAGE

CIRCUITS AT 100 AMPS OR LESS PER PHASE FOR ALLOCATION

PURPOSES

Foreword

Introduction: 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 7 version 3.10 in England and Wales.

Purpose: This Code defines the minimum requirements for a Metering and Data Collection System ("MDCS") required for the recording of electricity transfers at points of connection and/or supply 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.

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.   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 and specifically applies to the metering and data collection systems (MDCS) 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 S6 apply to the same circuit consumption. For clarity, the distinction is that Metering Code of Practice 6 sets out the requirements for Metering Equipment for Allocation purposes while Metering Code of Practice 7 specifies the requirements for Allocation purposes as part of a wider metering and Data Collection infrastructure providing data to the data processing interface. Metering Code of Practice 7 does not require Metering Code of Practice 6 Meters to be used. It would, however, be possible to construct a Metering Code of Practice 7 system using Metering Code of Practice 6 metering.

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 -

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;
SI 792	The Meters (Certification) Regulations 1990;
IEC 1334-4-4-41	Application Protocols: Distribution Line Message Specification;
BS EN 7799	Code of Practice for Information and Security Management;
Metering Code of Practice S4	Metering Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Allocation Purposes;
Metering 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

of Practice   Operators and Public Electricity Suppliers Distribution Businesses 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 6.

4. Electrical interface requirements

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

Import kWh

4.2 *Overall accuracy*: 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.

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

4.3 *Meters*: For each circuit direct connected Meters for the measurement of

4.3.2   Existing Meters may be used provided they were manufactured to the relevant British Standards. Ratings different from those quoted may be used in existing Meters provided they are appropriate for the supply being metered.

4.4   *Metering Equipment*:

4.4.1   All MDCS Metering Equipment (including energy storage device) shall have a minimum design service life, without maintenance, of ten (10) years from date of manufacture.

4.4.2   Where separate items of equipment are provided they shall be individually protected against electrical overload.

4.4.3   Where Metering Equipment 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 Metering Equipment i.e. supporting the clock for three (3) years without mains power.

4.4.4   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.

5.   Supplier interface requirements

5.1   *Displays and facilities at a Site*: This section sets out the displays that shall be provided at the Customer's site. If such facilities are provided

5.1.2   The MDCS shall store the following data for each Meter such that it can be readily displayed if required by the Supplier. If this data is displayed it shall be made readily available to the Supplier (see Section 6):

(i)   for Polyphase Meters:

        (a)   Maximum Demand ("MD") 6 digit (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate for the current and historic programmable charging period, e.g. monthly or statistical review period;

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

        (c)   number of MD resets (up to 99);

        (d)   multi-rate display sequence as specified by the Supplier, with a minimum of 8 Registers selectable over the calendar year; and

        (e)   current UTC or clock time and date as specified by supplier.

(ii)   for single phase Meters:

        (a)   multi-rate display sequence as specified

and the rate identifier. The initial operation of the display selector, if fitted, shall display the test display and the next operation shall display the total Import cumulative kWh. Subsequent operation of the display selector shall display register values in a sequence specified by the Supplier.

6.   SESL Requirements for the data processing interface

6.1   *Data Provision requirement*: The MDCS and its operator shall comply with BS7799 particularly Sections 6,7,8, and 9.

For each Meter, one Data Collector shall be responsible for Data Collection. The MDCS shall provide information in the formats specified in Appendix 1A, 1B and 2A. Open electronic data interchange standards shall be used.

6.1.1   Data requirements: Data at the data processing interface shall be provided for each Meter as follows and is further defined in Appendix 1:

(i)   For each data exchange of the MDCS with Data Processing and for each metered data stream:

(a)   kWh cumulative total Meter Register value for each Meter to 6 digit integer kWh value padded with leading zeroes where appropriate (see Section 6.   7 on the conversion algorithm);

(b)   the date and time of the recording of the

the current and previous programmable charging period e.g. monthly statistical review period as specified by the Supplier;

(e) multi-rate cumulative Active Energy registers as specified by Supplier;

(f) date of last MD reset if appropriate [YYMMDD]; and

(g) number of days data returned from Meter.

(ii) The MDCS shall provide the following data for each Day or partial Day where available, for each metered data stream:

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

Comment: Page: 13
inconsistency with display, what do we need to do here? See earlier comments.

Comment: Page: 12
inconsistency with display, what do we need to do here? There is a difference in display and storage requirements. Meters will only display kWhs while the meter will be capable of storing fractions of a kWh.

(b) Where a battery is fitted supporting a metering clock, a battery change maintenance flag shall be provided based on the standby battery service life;

(c) An indication should a metering clock failure occur;

(d) the number of successful password accesses (i.e. any access that changes static or dynamic data) made on that day to a maximum of 7;

(e) MD reset flag as appropriate;

(f) the Settlement Date [YYMMDD]; and

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

(iii) For each Demand Period the MDCS shall provide, for each metered data stream:

   (a) a flag to indicate if net reverse energy flow has taken place;

   (b) truncated absolute cumulative Meter Register reading in the range 10's of kWh, kWh, 1/10 kWh and 1/100 kWh;

   (c) a flag to indicate successful password access (i.e. any access that changes static or dynamic data); and

   (d) a flag to indicate that any power outage has occurred.

Where billing information is displayed in accordance with Section 6.1, it shall be provided to the Supplier via the interface.

6.1.2 Command requirements: The MDCS shall permit the following data request functions as a minimum:

   (i) read complete 30 minute database;

   (ii) last 'n' days of data, where 'n' is the number of days (n = 0 is the current day); and

   (iii) read selected Meters (if appropriate).

6.2 *Data accuracy*: Any discrepancy between the measured value of Active Energy at each individual Metering Point and the equivalent data

6.3.1   For unsynchronised metering clocks the limits of error for the time keeping shall be:-

         (i)   the completion of each Demand Period shall be at a time which is within $\pm$ 6 minutes of UTC; and

         (ii)   the duration of each Demand Period shall be within $\pm$ 2%, except where time synchronisation has occurred in a Demand Period.

6.3.2   Where synchronised metering clocks are used for the measurement of Demand Periods for Meter Registers then the overall system timing accuracy shall be:

         (i)   The completion of each Demand Period at a time to be within $\pm$ 30 seconds of UTC; and

         (ii)   the duration of each Demand Period to be within $\pm$ 1%.

6.4   *Security requirements*:

6.4.1   Data security: The MDCS shall include appropriate controls to provide reasonable assurance that all data held within it, and any related processing carried out by it, is complete, accurate, timely, and comes from an authorised source.

    The MDCS shall contain an appropriate means of uniquely authenticating that the data presented to the data processing

The MDCS shall use a protected mechanism to authenticate the user's identity. The MDCS shall protect authorisation data so that it cannot be accessed by any unauthorised user. The MDCS shall be able to enforce individual or group accountability by providing the capability to uniquely identify each MDCS user, and associate this identity with all auditable actions taken by that individual (see Section 7.7 on what actions are auditable).

6.4.3 Sealing: All Metering Equipment shall be sealed in accordance with the Meter Operator Code of Practice, Certification Regulations and the relevant Standards.

If the Metering Equipment uses a Maximum Demand (MD) reset button then this shall be capable of being sealed.

6.5 *Performance*: The MDCS shall be capable of demonstrating that it is able to technically and operationally meet these requirements before being accepted as a Metering Code of Practice S7 System. MDCS performance will be measured against the following parameters over a Calendar Month:

6.5.1 Each calendar month accurate (see Sections 5.2, 7.2 and 7.3) data shall be provided for at least 99% of Meters for at least 99% of the Demand Periods; and

6.5.2 If, due to unforeseen circumstances, the data cannot be delivered the MDCS shall be able to recover enough Metered

(iii)   permit the adaptation of data structures and dependent processes to meet changes demanded by regulatory and other appointed organisations;

(iv)   facilitate a comprehensive and reliable recovery process;

(v)   provide protection from unauthorised access;

(vi)   facilitate the effective operation of any data warehousing, database gateway, message warehouse, or message gateway initiatives where required; and

(vii)   facilitate the effective operation of any other data consistency management programme.

6.6.2   Physical integrity:

(i)   The MDCS shall permit detection and rectification of any failure that leads to a break of the performance requirements set out in Sections 7.5 and 7.2 on a timely basis.

(ii)   The MDCS shall be capable of detecting when communication links are disabled, and be able to take appropriate measures to ensure that no data is lost, corrupted or duplicated.

6.6.3   Backup and system continuity:

acknowledged by the data processing interface. Where duplication is undertaken all reasonable precautions shall be taken and demonstrated to avoid common mode failure and faults.

6.7 *Audit Requirements*: This Section defines the audit requirements over and above those requirements of the business, to ensure the proper operation of the MDCS.

6.7.1 Scottish Settlements authorised agents shall be able to evaluate MDCS security and accountability by a secure means, within a reasonable time, and without undue difficulty.

6.7.2 The MDCS shall permit direct read access to any data stored in any part of the MDCS for audit purposes.

6.7.3 There shall be an adequate audit trail which is sufficient to allow tracing of individual Meter readings back to the Meter.

6.7.4 All access to the MDCS for reprogramming or re-configuration of any element of the MDCS shall be supported by an adequate (see below) audit trail. The audit trail system design shall be subject to the approval of the Market Auditor. Audit trails may be archived but shall be available for inspection to the Market Auditor. The audit data shall be protected by the system so that read access to it is limited to those who are authorised for audit data. The system shall be able to record the following events:

(i) failed use of authentication mechanisms;

made to the MDCS, the audit record shall identify the change. The system administrator shall be able to selectively audit the actions of any one or more users based on individual identity.

6.7.6 The algorithms performing the conversion to kWh shall be documented and approved.

6.7.7 The Market Auditor will be asked to approve all MDCS prior to their operation to ensure that the appropriate controls have been incorporated within it to achieve the above mentioned control objectives.

6.8 *Communications with data processing interface*: The outline data structure for the information required in Section 7.1.1 is detailed in Appendix 1a. The data structure and format for the data items specified in Section 7.1.1 are detailed in Appendix 1b. The Data Definitions and Descriptions are detailed in Appendix 2a.

6.9 *Archiving:* Audit trail archives shall be maintained for 7 years from the Final Reconciliation Run to which archives relate.

7. Third Party interface requirements

7.1 *Access To data:* Access to metering data shall be in accordance with the provisions of this Agreement and the Market Procedures referred to therein. Such access shall not interfere with or endanger the security of the data or the collection process for Allocation purposes.

7.2 *Additional features*: Additional features may be incorporated within or

Appendix 1

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

8.1.1   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.

8.1.2   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.

8.1.3   The following guidelines have been established for local communications:

(i)   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 9.1.3.2.

(ii)   Chronological inconsistencies in the data block

periods), or level 2 password access occurred during these periods.

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

OUTLINE DATA STRUCTURE

Block	Description
"TAG" DATA HEADER BLOCK	Meter Identifier - MID Date/Time of reading kWh Cumulative Reading MD & Multi-rate info. No. of days data in message
DAILY HEADER BLOCK 0 CURRENT DAY	Date kWh Cumulative Reading Security Data/Flags
DATA BLOCK CURRENT DAY	Data array of 48 fields Each field containing the kWh Value - XX.XX Security Flag arrays
DAILY HEADER BLOCK 1 PREVIOUS DAY	Date kWh Cumulative Reading Security Data/Flags
DATA BLOCK PREVIOUS DAY	Data array of 48 fields Each field containing the kWh Value - XX.XX Security Flag arrays
DAILY HEADER BLOCK n-1 CURRENT DAY - (n-1)	Date kWh Cumulative Reading Security Data/Flags
DATA BLOCK CURRENT DAY - (n-1)	Data array of 48 fields Each field containing the kWh Value - XX.XX Security Flag arrays
DIGITAL SIGNATURE	Data authentication block

Elapsed Time

8.2.1   "TAG" Data Header Block

(i)   Meter Identifier-MID

Character Mapping

```
P  P  P    M   Y  Y     X  X  X  X  X  X
|_____|    |   |__|     |_____|
    |      |     |              |_____ 6 digit alpha-numeric
    |      |     |_____ Last 2 digits of year of manufacture
    |      |_____ Manufacturers Code
    |_____ Free format data field
```
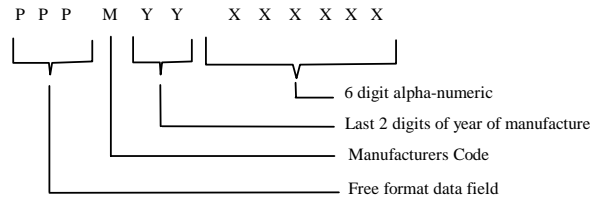
Field	Character	Type	Range	Field Padding	Allowed Case
PPP	P	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper or Lower Case
M	M	Alpha	A-Z	-	Upper Case Only
YY	Y	Numeric	0-9	-	-
XXX XXX	X	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper Case Only

(ii)   Date and Time of Reading of Meter

```
Y  Y   M  M   D  D    h  h   m  m   s  s
|__|   |__|   |__|    |__|   |__|   |__|
  |      |      |       |      |      |____ Seconds
  |      |      |       |      |_____ Minutes
  |      |      |       |_____ Hours
  |      |      |_____ Day
  |      |_____ Month
  |_____ Year
```
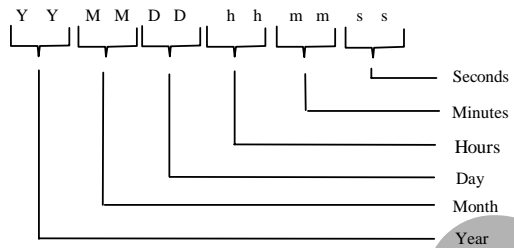
(iv)   Maximum Demands - MDs

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.

(a)   MD in kW in current charging period;

(b)   MD in kW in previous charging period;

and

(c)   Cumulative Maximum Demand.

Register ID	1000's	100's	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

(v)   Date of Last MD Reset

Date of the last MD reset consisting of:-

Y Y   M M   D D

Day

Month

Year
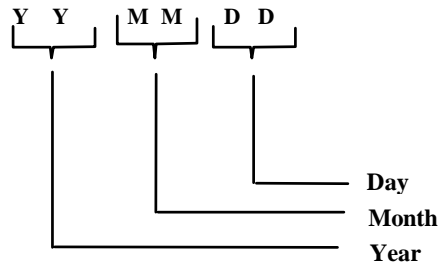
(vi)   Number of Maximum Demand Resets

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.

(viii)   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

(i)   Day Identifier

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

Y   Y   . M M .   D D

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 decawatt hour value, padded with leading zeroes where appropriate.

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

(iii)   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.

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

(b)   BM - Battery Maintenance Flag;

(c)   CF - Clock Failure;

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

(e)   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

Tens	Units	Tenths	Hundredths

Appended for each 30 minute record are three security flags:

(a)   Reverse running indication;

(b)   Successful level 2 password access; and

(c)   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).

Appendix 2: 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*:

9.3.2   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

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

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

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))

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

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

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.

	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.

read-write flag   WRITE-ONLY

available   TRUE

}

9.19   *Free Format Field of Meter ID*:

    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

    }

Appendix 3: Authentication

10.1   *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

10.2   *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:

     10.2.1   The authentication key

     10.2.2   The data block,

     10.2.3   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

Appendix 4: 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;

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

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

- 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.

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

- 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.

- 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.

- 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.

- Where Maximum Demand (MD) metering is being operated the MD shall be programmable to reset automatically as defined by 13 MD reset dates.
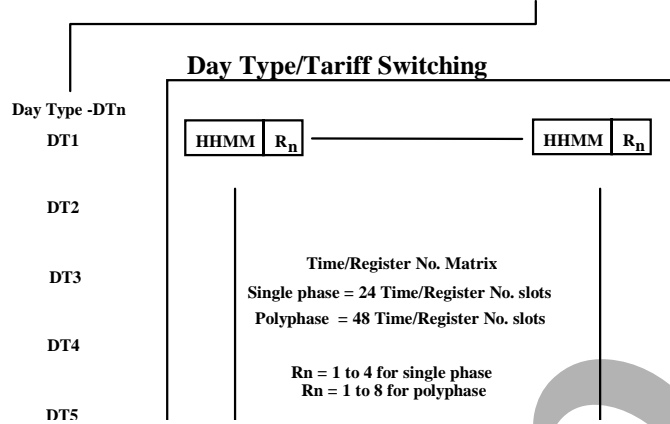
Trigger Dates For Start of Seasons

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

Season No. Sn	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

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 2:00am by 'H' hours on date specified

Appendix 5: Generic Derogations

No generic Derogation applicable to this Code.

Appendix 6: 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;

	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 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

	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

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

"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

"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;

	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

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:-

(a) 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

"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

	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

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:-

(a)   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

(b)   each Transmission or Distribution 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

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

Point;

(c) the point of connection of an Exempt Distribution System or a Customer to a Distribution System or a Transmission System; and

(d) 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:-

(a) is a Founder Supplier;

(b) is a supplier with an exemption under the Act;

(c) is a Second Tier Supplier and who was admitted as a Party in the capacity of a Supplier; or

(d) in accordance with Clause 6.8 has changed capacity such that it participates as a Party in the capacity of a Supplier ;

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;