CODE OF PRACTICE THREE

CODE OF PRACTICE FOR THE METERING OF CIRCUITS WITH A RATED CAPACITY NOT EXCEEDING 10MVA FOR SETTLEMENT PURPOSES.

Issue 3

Version 2.03

DATE 01 May 1997

Code of Practice Three

CODE OF PRACTICE FOR THE METERING OF CIRCUITS WITH A RATED CAPACITY NOT EXCEEDING 10MVA FOR SETTLEMENT PURPOSES.

1 Reference is made to the Pooling and Settlement Agreement for the Electricity Industry in England and Wales dated 30th March 1990, and as amended and restated in 17th October 1996 and, in particular, to the definitions of "Code of Practice" and "Synopsis of Metering Codes" in clause 1.1 thereof.

2. Subject to Part 5 of Schedule 21 of the Pooling and Settlement Agreement, this Code of Practice shall apply to Metering Equipment comprising Metering Systems entered on to the Register on or after [1st May 1997] .

3. This Code of Practice has been approved by the Executive Committee, the Settlement System Administrator, the Grid Operator, and the Ancillary Service Provider.

For and on behalf of the Executive Committee.	For and on behalf of the Grid Operator.
For and on behalf of Energy Settlements and Information Services Limited as the Settlement System Administrator.	For and on behalf of the Ancillary Service Provider.

AMENDMENT RECORD

ISSUE	DATE	VERSION	CHANGES	AUTHOR	APPROVED
Draft	18/3/93	0.03	Recommended to PEC	MSC	
1	15/4/93	1	Endorsed by PEC	COP WG	
	19/4/95	1.01	Draft	COPWG	
	14 June 1995	1.02	Draft	COPWG	
	22 June 1995	1.03	Draft for MDC	COP WG	
	27 July 1995	1.04	Draft following comments by MDC	COP WG	Approved by MDC 7/9/95
2	8th Sept 1995	2.00	Implementation date agreed by MDC	COP WG	
3	01/05/97	2.03	Amendments for 100kW Take-on	1998 Programme	Approved by MDC 01/05/97
6					
7					
8					
9					
10					
11					
12					
13					

CODE OF PRACTICE FOR THE METERING OF CIRCUITS WITH A RATED CAPACITY NOT EXCEEDING 10MVA FOR SETTLEMENT PURPOSES.

CONTENTS **Page number**

CONTENTS **Page number**

FOREWORD

This Code of Practice defines the minimum requirements for the Metering Equipment required for the measurement and recording of electricity transfers at Defined Metering Points where the rated circuit capacity does not exceed 10MVA.

For the purpose of this Code of Practice the rated circuit capacity in MVA shall be determined by the lowest rated primary plant (e.g. transformer rating, line rating, etc.) of the circuit. The Metering Equipment provision and accuracy requirements shall anticipate any future up-rating consistent with the installed primary plant. The primary plant maximum continuous ratings shall be used in this assessment.

In cases where a number of circuits connected to a common busbar are metered using summation current transformers, the rated circuit capacity shall be determined from the Maximum Aggregated Capacity in MVA. For such metering installations the reference in the text to "each circuit" shall be interpreted as the output from each summation current transformer.

Energy Settlements and Information Services Limited, as Settlement System Administrator ("SSA") shall retain copies of, inter alia, the Code of Practice together with copies of all documents referred to in them, in accordance with the provisions of the Pooling and Settlement Agreement ("P&SA").

1. SCOPE

This Code of Practice states the practices that shall be employed, and the facilities that shall be provided for the measurement and recording of the quantities required for Settlement purposes on each circuit where the rated capacity does not exceed 10MVA.

It derives force from the metering provisions (Part XV) of the P&SA, to which reference should be made. It should also be read in conjunction with any relevant Agreed Procedures.

This Code of Practice does not contain the calibration, testing and commissioning requirements for Metering Equipment used for Settlement purposes. These requirements are detailed in Code of Practice Four - "Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Settlement Purposes".

Dispensations from the requirements of this Code of Practice may be sought in accordance with the P&SA and the relevant Agreed Procedure.

In the event of an inconsistency between the provisions of this Code of Practice and the P&SA, the provisions of the P&SA shall prevail.

2. REFERENCES

The following documents are referred to in the text:-

BS EN 61036	AC Static Watthour Meters for Active Energy (Classes 1 and 2)
BS EN 60521	Specification for Class 0.5, 1 and 2 Single-Phase and Polyphase, Single Rate and Multi-Rate Watt-Hour Meters
Draft IEC Standard 1268	Alternating Current Static Var-Hour Meters for Reactive Energy (Classes 2 and 3)
BS 5685 Part 4	Specification for Class 3 Var-Hour Meters
IEC Standard 44-3	Instrument Transformers - Combined Transformers
IEC Standard 185	Current Transformers
IEC Standard 186	Voltage Transformers
BS EN 61107	Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange.
Pooling and Settlement Agreement	Definitions, Part XV and Agreed Procedures
Code of Practice Four	Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Settlement Purposes
Metering Sub-Committee paper MSC318	Proposals for Metering Compensations for the FMS - Power Station Metering
Electricity Act 1989	Schedule 7 as amended by Schedule 1 to the Competition and Services (Utilities) Act 1992.

3. DEFINITIONS AND INTERPRETATIONS

Save as otherwise expressly provided herein, words and expressions used in this Code of Practice shall have the meanings attributed to them in the P&SA.

The following definitions, which also apply, supplement or complement those in the P&SA and are included for the purpose of clarification.

3.1 Active Energy

Active Energy means the electrical energy produced, flowing or supplied by an electrical circuit during a time interval, and being the integral with respect to time of the instantaneous power, measured in units of watt-hours or standard multiples thereof, that is:-

1,000 Wh = 1 kWh
1,000 kWh = 1 MWh
1,000 MWh = 1 GWh
1,000 GWh = 1 TWh

3.2 Active Power

Active Power means the product of voltage and the in-phase component of alternating current measured in units of watts and standard multiples thereof, that is:-

1,000 Watts = 1 kW
1,000 kW = 1 MW
1,000 MW = 1 GW
1,000 GW = 1 TW

3.3 Actual Metering Point

Actual Metering Point means the physical location at which electricity is metered.

3.4 Apparent Energy

Apparent Energy means the integral with respect to time of the Apparent Power.

3.5 Apparent Power

Apparent Power means the product of voltage and current measured in units of volt-amperes and standard multiples thereof, that is:-

1,000 VA = 1 kVA
1,000 kVA = 1 MVA

3.6 CTN

CTN means the Electricity Supply Industry (ESI) corporate telephone network.

3.7 Defined Metering Point

Defined Metering Point means the physical location at which the overall accuracy requirements as stated in this Code of Practice are to be met. The Defined Metering Points are identified in Appendix A.

3.8 Demand Period

Demand Period means the period over which Active Energy, Reactive Energy or Apparent Energy are integrated to produce Demand Values. For Settlement purposes, unless the context requires otherwise, each Demand Period shall be of 30 minutes duration, one of which shall finish at 24:00 hours.

3.9 Demand Values

Demand Values means, expressed in MW, Mvar or MVA, twice the value of MWh, Mvarh or MVAh recorded during any Demand Period. The Demand Values are half hour demands and these are identified by the time of the end of the Demand Period.

3.10 Electricity

"Electricity" means Active Energy and Reactive Energy.

3.11 Export

Export means, for the purposes of this Code of Practice, an electricity flow as indicated in Figure 1 of Appendix B.

3.12 Import

Import means, for the purposes of this Code of Practice, an electricity flow as indicated in Figure 1 of Appendix B.

3.13 Interrogation Unit

Interrogation Unit means a Hand Held Unit "HHU" (also known as Local Interrogation Unit "LIU") or portable computer which can enter Metering Equipment parameters and extract information from the Metering Equipment and store this for later retrieval.

3.14 Maximum Aggregated Capacity

The maximum aggregated capacity for multiple circuits shall be determined for:-

(a) Generator circuits, by the summation of the capacities of the lowest primary plant rating for each circuit.

(b) Network or customer circuits all of equal rating, by multiplying the lowest primary plant rating of one circuit by one less than the number of circuits involved,

e.g. number of circuits (n) = 3, factor = n - 1 = 2.

(c) Network or customer circuits of different ratings, (all of which must be under 10 MVA) by summation of the lowest plant rating for each circuit ignoring the highest rated circuit e.g. 3 circuits rated at 4.5 MVA, 4.0 MVA, 3.5 MVA, rating = 7.5 MVA.

3.15 Meter

Meter means a device for measuring Active Energy and/or Reactive Energy electrical energy.

3.16 Metering Equipment

Metering Equipment means Meters, measurement transformers (voltage, current and 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 at or relating to a Site.

3.17 Meter Register

Meter Register means a device, normally associated with a Meter, from which it is possible to obtain a reading of the amount of Active Energy, or the amount of Reactive Energy that has been supplied by a circuit.

3.19 Non-Embedded Customer

Non-Embedded Customer means any customer, other than a PES, receiving electricity direct from the NGC Transmission System, irrespective of from whom it is supplied.

3.19 Outstation

Outstation means on-site equipment which receives and stores data from a Meter(s), for the purposes, inter-alia, of transfer of that metering data to the Settlements Systems Administrator 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.

3.20 Outstation System

Outstation System means one or more Outstations linked to a single communication line.

3.21 PARh Meter

PARh Meter means a phase-advanced reactive hour (PARh) Meter which is used for obtaining Import and Export Reactive Energy from one integrating Meter. The Reactive Energy Demand values shall be calculated using a formula involving the PARh Meter and the associated Active Energy Meter Demand Values.

3.22 Password

Password means a string of characters of length no less than six characters and no more than twelve characters, where each character is a case insensitive alpha character (A to Z) or a digit (0 to 9) or the underscore character (_). Passwords must have a minimum of 2,000,000,000 combinations, for example six characters if composed of any alphanumeric characters or eight characters if composed only of hexadecimal characters (0 to F).

3.23 PSTN

PSTN means the public switched telephone network.

3.24 Rated Measuring Current

Rated Measuring Current means the rated primary current of the current transformers in primary plant used for the purposes of measurement.

3.25 Reactive Energy

Reactive Energy means the integral with respect to time of the Reactive Power.

3.26 Reactive Power

Reactive Power means the product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof, that is:-

1,000 var = 1 kvar
1,000 kvar = 1 Mvar

3.27 Settlement Instation

Settlement Instation means a computer based system which collects or receives data on a routine basis from selected Outstation Systems on behalf of Pool Members or by Agents of Pool Members.

3.28 UTC

UTC means Co-ordinated Universal Time based on atomic clocks as distinct from

Greenwich Mean Time (GMT).

4. MEASUREMENT CRITERIA

4.1 Measured Quantities and Demand Values

4.1.1 Measured Quantities

For each separate circuit the following energy measurements are required for Settlement purposes:-

(i) Import MWh *

(ii) Export MWh *

(iii) Import Mvarh

(iv) Export Mvarh

4.1.2 Demand Values

For each Demand Period for each circuit the following Demand Values shall be provided:-

(i) Import MW *

(ii) Export MW *

(iii) Import Mvar

(iv) Export Mvar

* Subject to the agreement of the SSA where system or plant conditions permit, either the Import or Export quantities may be omitted.

4.2 Accuracy Requirements

4.2.1 Overall Accuracy

The overall accuracy of the energy measurements at or referred to the Defined Metering Point shall at all times be within the limits of error as shown:-

(i) Active Energy

CONDITION	LIMIT OF ERRORS AT STATED SYSTEM POWER FACTOR	
Current expressed as a percentage of Rated Measuring Current	Power Factor	Limits of Error
120% to 10% inclusive	1	± 1.5%
Below 10% to 5%	1	± 2.0%
120% to 10% inclusive	0.5 lag and 0.8 lead	± 2.5%

(ii) Reactive Energy

CONDITION	LIMIT OF ERRORS AT STATED SYSTEM POWER FACTOR	
Current expressed as a percentage of Rated Measuring Current	Power Factor	Limits of Error
120% to 10% inclusive	Zero	± 4.0%
120% to 20% inclusive	0.866 lag and 0.866 lead	± 5.0%

These limits of error for both (i) and (ii) above shall apply at the Reference Conditions defined in the appropriate meter specification.

Evidence to substantiate that these overall accuracy requirements are met shall be available for inspection to the SSA or its agent .

4.2.2 Compensation for Measurement Transformer Error

To achieve the overall accuracy requirements it may be necessary to compensate Meters for the errors of the measurement transformers and the associated leads to the meters. Values of the compensation shall be recorded and evidence to justify the compensation criteria, including wherever possible test certificates, shall be available for inspection by the SSA or its Agent.

4.2.3 Compensation for Power Transformer and Line Losses

Where the Actual Metering Point and the Defined Metering Point do not coincide then, where necessary compensation for power transformer and/or line losses shall be provided to meet the overall accuracy at the Defined Metering Point.

The compensation may be achieved in the Metering Equipment and in this event the applied values shall be recorded. Supporting evidence to justify the compensation criteria shall be available for inspection by the SSA or its Agent.

Alternatively, the compensation may be applied in the software of the relevant data aggregation system used for Settlement purposes. In this event the factors shall be passed to the appropriate agency and evidence to justify the compensation criteria shall be made available for inspection by the SSA or its Agent.

A paper endorsed by the Metering Sub-Committee on the loss compensation of power station LV connected meters is "Proposals for Meters Compensations for the FMS - Power Station, Metering" (MSC paper reference "MSC 318"). This paper may be used for guidance purposes.

5. METERING EQUIPMENT CRITERIA

Although for clarity this Code of Practice identifies separate items of equipment, nothing in it prevents such items being combined to perform the same task provided the requirements of this Code of Practice are met.

Metering Equipment other than outdoor measurement transformers, shall be accommodated in a clean and dry environment.

5.1 Measurement Transformers

For each circuit current transformers (CT) and voltage transformers (VT) shall meet the requirements set out in clauses 5.1.1 and 5.1.2.

Additionally, where a combined unit measurement transformer (VT & CT) is provided the 'Tests for Accuracy' as covered in clause 8 of IEC Standard 44-3 covering mutual influence effects shall be met.

The terms "current transformer" and "voltage transformer" used below do not preclude the use of other measuring techniques with a performance equal to that specified for such measurement transformers.

5.1.1 Current Transformers

One set of current transformers in accordance with IEC Standard 185 and with a minimum standard of accuracy class 0.5S (irrespective of the secondary current rating of the current transformers) shall be provided. Preferably the current transformers shall be dedicated for Settlement purposes, but the CTs may be used for other purposes provided the overall accuracy requirements in clause 4.2.1 are met and evidence of the value of the additional burden is available for inspection by the SSA or its agent. The additional burden shall not be modified without prior notification to the SSA, and evidence of the value of the modified additional burden shall be available for inspection by the SSA or its Agent.

CT test certificates showing errors at the overall working burden or at burdens which enable the working burden errors to be calculated shall be available for inspection by the SSA or its agent.

The total burden on each current transformer shall not exceed the rated burden of such CT.

5.1.2 Voltage Transformers

A single voltage transformer secondary winding in accordance with IEC Standard 186 and with a minimum standard of accuracy class 1 shall be provided for the main and check metering of a circuit. The voltage transformer may be used for other purposes provided the overall accuracy requirements in clause 4.2.1 are met and evidence of the value of the additional burden is available for inspection by the SSA or its Agent. The additional burden shall not be modified without prior notification to the SSA, and evidence of the value of the modified additional burden shall be available for inspection by the SSA or its Agent.

A VT test certificate(s) showing errors at the overall working burden(s) or at burdens which enable the working burden errors to be calculated shall be available for inspection by the SSA or its agent.

The total burden on each secondary winding of a VT shall not exceed the rated burden of such secondary winding.

The VT supplies shall be fused as close as practicable to the VT, with a set of isolating links provided locally to the Metering Equipment, suitably identified.

In addition, fusing shall be provided locally for:-

(a) the main Meter(s)
(b) the check Meter(s)
(c) any additional Metering Equipment burden
(d) any additional non-Metering Equipment burden e.g. non-Pool meters, protection, etc..

Local fusing shall discriminate with the source fusing.

The arrangement is illustrated in Appendix C.

Where summation CTs are used, and individual circuit voltage transformers are fitted, a VT selection relay scheme involving each circuit shall be provided.

5.1.3 Measurement Transformers Installed on Existing Circuits

Where circuits, other than those newly installed, are to be metered to this Code of Practice and where the installed measurement transformers do not comply with the class accuracies specified in clauses 5.1.1 & 5.1.2, then such measurement

transformers may be used providing the following requirements and those in clause 4.2.1 are met:-

(i) Where subsequently a significant alteration to the primary plant (e.g. a switchgear change) is carried out, new measurement transformers as detailed in clauses 5.1.1 and 5.1.2, shall be provided.

(ii) In all other respects the requirements of clauses 5.1.1 and 5.1.2 are met.

5.2 Testing Facilities

Testing facilities shall be provided close by the Meters of each circuit, which enables such Meters to be tested safely with the circuit energised.
(see Appendix C)

5.3 Meters

The Meters may be either static or induction disc types.

For each circuit main and check Active Energy Meters shall be supplied. These Meters shall meet the requirements of either BS EN 61036 Class 1 or BS EN 60521 Class 1. Subject to the agreement of the SSA where system or plant conditions permit either the Import or Export Meters may be omitted.

Active Energy Meters provided for the metering of supplies to customers shall be in accordance with Schedule 7 of the Electricity Act 1989.

For each circuit only main Reactive Energy Meter(s) need be supplied. The Reactive Energy Meters shall meet the requirements of either the Draft IEC Standard 1268 Class 3.0 or BS 5685 Part 4.

For existing metering installations a Reactive Meter connected in a PARh Meter configuration may be retained.

Active Energy Meters shall be configured such that the number of measuring elements is equal to or one less than the number of primary system conductors. These include the neutral conductor, and/or the earth conductor where system configurations enable the flow of zero sequence energy.

All Meters shall be labelled or otherwise be readily identifiable in accordance with Appendix B.

All Meters supplied via measurement transformers shall be set to the actual primary and secondary ratings of the measurement transformers and the ratios displayed as follows:-

(a) For Meters separate from the display and/or Outstation the ratios shall be recorded on the nameplate of the Meter.

(b) For static Meters combined with the display and/or the Outstation the ratios shall be displayed and downloaded during the interrogation process. In addition, the compensation factor that has been applied for measurement transformer errors and/or system losses, where this is a constant factor applied at security level 3 shall be similarly displayed and downloaded.

All Meters shall include a non-volatile Meter Register of cumulative energy for each measured quantity. The Meter Register(s) shall not roll-over more than once within the normal Meter reading cycle.

Meters which provide data to separate Outstations shall for this purpose provide an output per measured quantity.

For Meters using electronic displays due account shall be taken of the obligations of the SSA to obtain Meter readings.

5.4 Displays and Facilities for Registrant Information

5.4.1 Displays

The Metering Equipment shall have the ability to display the following information:-

(i) measured quantities as per clause 4.1.1

(ii) current time ("UTC") and date;

* (iii) Maximum Demand ("MD") for MW per programmable charging period, i.e. monthly or statistical review period;

* (iv) Maximum Demand ("MD") for MVA per programmable charging period, i.e. monthly or statistical review period;

* (v) twice the MWh advance since the commencement of a current Demand Period, (i.e. "MW rising demand");

* (vi) twice the MVAh advance since the commencement of a current Demand Period, (i.e. "MVA rising demand");

* (vii) cumulative MD;

* (viii) number of MD resets;

* (ix) multi-rate display sequence as specified by the Registrant , with a minimum of 8 rates selectable over the calendar year;

(x) indication of reverse running for Active Energy where appropriate;

(xi) the CT and/or VT ratios that the Meter has been programmed to, where appropriate; and

(xii) the compensation factor that has been applied for measurement transformer errors and/or system losses, where this is a constant factor applied at security level 3. (i.e. where the Meter is combined with the display and/or Outstation).

MD shall be resettable at midnight of the last day of a charging period and for part chargeable period demands. If a manual reset button is provided then this shall be sealable.

* Where displays are marked with an asterisk the Registrant shall specify which displays are to be enabled.

5.4.2 Facilities

The Metering Equipment shall be capable of providing the following information locally to the Customer or Registrant:-

(i) impulsing for MWh and either MVAh or Mvarh - all to be voltage free contacts with a pulse rate at full load of between 0.1 and 2 pulses per second with a nominal duration of 80mS per pulse; and

(ii) a 30 minute reset pulse from voltage free contacts with a minimum duration of 0.5 second and a maximum duration of 10 seconds.

5.5 Outstation

An Outstation System shall be provided which transfers data to and receives data from a Settlement Instation.

Where one or more separate Outstations are provided each Outstation shall store the main and check Meter data for one or more circuits up to a Maximum Aggregated Capacity of 100 MVA.

Separate Outstations storing data from a number of different circuits, and Meters with integral Outstation facilities shall be capable of utilising one communication line.

The Outstation data shall be to a format and protocol approved by the SSA or its Agent.

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 7 of this Code of Practice are satisfied.

For the purpose of transferring stored metering data from the Outstation to the Settlement Instation, a unique Outstation identification code shall be provided.

Facilities shall be provided to select a relevant demand period from one of the following values:-

30, 20, 15, 10 and 5 minutes with in each case one demand period ending on the hour.

Normally metering data will be collected by the Settlement Instations by a daily interrogation, but repeat collections of metering data shall be possible throughout the Outstation data storage period.

The Outstation System supply shall either be from a secure supply or from a measurement VT, with separate fusing for each Outstation.

Where a separate modem associated with the Outstation System is used, then it shall be provided with a separately fused supply either from a secure supply or from a measurement VT. Alternatively, line or battery powered modem types may be used.

Where a measurement VT source is used and the Outstation System is storing data for more than one circuit, a VT selection relay scheme involving each circuit shall be provided.

For Outstations separate from the Meters, preferably the Outstation shall be able to continue all normal functions for a period of 120 hours after a supply failure. Outstations not providing this facility must in the event of a supply failure transmit an alarm signal to a manned point.

The Outstation shall not convert PARh metering data to vars.

5.5.1 Data Storage

Data storage facilities for metering data shall be provided as follows:-

(i) a storage capacity of 48 periods per day for a minimum of 20 days for all Demand Values.

(ii) the stored Demand Values shall be integer values of kW or kvar, or pulse counts, and have a resolution of better than ±0.1% (at full load);

(iii) the accuracy of the energy values derived from Demand Values shall be within ±0.1% (at full load) of the amount of energy measured by the associated Meter;

(iv) 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;

(v) where a separate Outstation is used, cumulative register values shall be provided in the Outstation which can be set to match and increment with the Meter Registers;

(vi) in the event of an Outstation supply failure, the Outstation shall protect all data stored up to the time of the failure, and maintain the time accuracy in accordance with clause 5.5.2;

(vii) partial Demand Values, those in which an Outstation supply failure and/or restoration occurs, and zero Demand Values associated with an Outstation supply failure, shall be marked so that the Settlement Instation can identify them;

(viii) to cater for continuous supply failures, the clock, calendar and all data shall be supported for a period of 20 days without an external supply connected;

(ix) any "read" operation shall not delete or alter any stored metered data; and

(x) an Outstation shall provide all of the metered data stored from the commencement of any specified date upon request by the Settlement Instation.

5.5.2 Time Keeping

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

(ii) Time synchronisation of the Outstation shall only be performed remotely by communication with the Settlement Instation. Locally, time synchronisation may be performed by an Interrogation Unit provided it has been synchronised to UTC within the previous 24 hours.

(iii) The overall limits of error for the time keeping allowing for a failure to communicate with the Outstation for an extended period of 20 days shall be:-

(a) the completion of each Demand Period shall be at a time which is within ± 20 seconds of UTC; and

(b) the duration of each Demand Period shall be within ± 0.1%, except where time synchronisation has occurred in a Demand Period.

5.5.3 Monitoring Facilities

Monitoring facilities shall be provided for each of the following conditions and shall be reported, as separate alarm indications, tagged to the relevant Demand Period(s), via on-line communications and the local Interrogation Unit:-

(i) phase failure of any one or combination of phases;

(ii) Metering Equipment resets caused by other than a supply failure (where fitted);

(iii) battery monitoring (where battery fitted);

(iv) interrogation port access which changes time and/or date;

(v) interrogation port access which changes data other than time and/or date; and

(vi) reverse running (if fitted).

In addition to (ii), detected errors in Metering Equipment functionality should be recorded as an event alarm with date and time.

Any alarm indications shall not be cancelled or deleted by the interrogation process and shall be retained with the data until overwritten. The alarm shall reset automatically when the abnormal condition has been cleared.

5.6 Communications

Outstation(s) shall provide both local and remote interrogation facilities, from separate ports.

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

(i) Level 1 - Password for:-

Read only of the following metering data, which shall be transferable on request during the interrogation process:-

(a) Outstation ID;

(b) Demand Values as defined in clause 4.1.2 for main and check Meters;

(c) cumulative measured quantities as defined in clause 4.1.1 for main and check Meters;

(d) Maximum Demand (MD) for MW or MVA per programmable charging period i.e. monthly, statistical review period;

(e) multi-rate cumulative Active Energy as specified by Registrant.

(f) the measurement transformer ratios, where appropriate;

(g) the measurement transformer error correction factor and/or system loss factor, where this is a constant factor applied to the entire dynamic range of the Meter and the Meter is combined with the display and/or Outstation;

(h) alarm indications; and

(i) Outstation time and date.

(ii) Level 2 - Password for:-

(a) corrections to the time and/or date; and
(b) resetting of the MD.

(iii) Level 3 - Password for:-

Programming of :-

(a) the Displays and Facilities as defined in Section 5.4;

(b) the measurement transformer ratios, as appropriate;

(c) the measurement transformer error correction and/or system loss factor where this is a constant factor applied to the entire dynamic range of the Meter and the Meter is combined with the display and/or Outstation; and

(d) the passwords for levels 1, 2 and 3.

In addition, it shall be possible to read additional information within the Metering Equipment to enable the programmed information to be confirmed.

(iv) Level 4 - Password or removal of Metering Equipment cover(s) necessitating the breaking of a seal for :-

(a) calibration of the Metering Equipment;

(b) setting the measurement transformer ratios, as appropriate;

(c) programming the measurement transformer error correction factor and/or system loss factor where this is other than a single factor; and

(d) programming the level 3 password and the level 4 password, if appropriate.

In addition to the functions specified for each level it shall be feasible to undertake the functions at the preceding level(s). e.g. at level 3 it shall also be possible to carry out the functions specified at levels 1 and 2. This need not apply at level 4 when access is obtained via removing the cover.

Different Passwords shall be utilised for each level, which shall only be circulated in accordance with the Agreed Procedures.

5.6.1 Local Interrogation

An interrogation port shall be provided for each Outstation which preferably shall be an opto port to BS EN 61107, and with a serial protocol such as BS EN 61107.

5.6.2 Remote Interrogation

Remote interrogation facilities shall be provided with error checking of the communications between the Outstation System and the Settlement Instation.

It shall not be possible to disconnect this link at the Outstation without the breaking of a Settlement seal.

Interrogation of an Outstation shall be possible using one of the following media:

(i) Switched telephone networks e.g. PSTN or CTN;
(ii) Public data networks e.g. PSN;
(iii) Radio data networks e.g. Paknet or any equivalent;
(iv) Customer own network;
(v) Mains signalling / power line carrier;
(vi) Low power radio;
(vii) Satellite; or
(viii) Cable TV.

In addition any further media may be used as specified by the SSA or its Agent.

The actual media employed shall be in accordance with the requirements of the SSA or its Agent.

The data shall be to a format and protocol approved by the SSA or its Agent.

5.7 Sealing

All Metering Equipment shall be capable of being sealed in accordance with the relevant Agreed Procedures.

6. ASSOCIATED FACILITIES

6.1 Interrogation Unit

The Operator may interrogate the Metering Equipment using an Interrogation Unit (IU). 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 Settlement Instation.

The IU shall have a built-in security system, such as a password, so that the IU 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 IU 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 Settlement process.

7. ACCESS TO DATA

Access to metering data shall be in accordance with the provisions of the P&SA and the Agreed Procedures referred to therein. Such access must not interfere with or endanger the security of the data or the collection process for Settlement purposes.

Access to stored metering data in Outstations shall also be the right of the Registrant and any party who has the permission of the Registrant.

APPENDIX A

DEFINED METERING POINTS

For transfers of electricity between the following parties the Defined Metering Point (DMP) shall be at one of the following locations:-

1. For transfers between The National Grid Company plc and a single Public Electricity Supplier where no other Party(s) are connected to the busbar, the DMP shall be at the lower voltage side of the supergrid connected transformer.

2. For transfers between The National Grid Company plc and a single Public Electricity Supplier where other Party(s) are connected to the busbar, the DMP shall be at the circuit connections to that Public Electricity Supplier.

3. For transfers between The National Grid Company plc and more than one Public Electricity Supplier connected to the same busbar, the DMP shall be at the circuit connections of each Public Electricity Supplier to such busbar.

4. For transfers between Public Electricity Suppliers not including a connection to the transmission system of The National Grid Company plc, the DMP shall be at the point of connection of the two Public Electricity Suppliers.

5. For transfers between The National Grid Company plc and Generators, the DMP shall be at the high voltage side of the generator transformers and station transformer(s).

6. For transfers between Public Electricity Suppliers and Generators, the DMP shall be at the point(s) of connection of the generating station to the Public Electricity Supplier.

In the case of (5) and (6) above the following shall also apply:-

Each Generating Unit which is subject to Central Despatch shall have Metering Equipment which identifies uniquely the electricity transfers of the despatched unit. In the case of range Combined Cycle Gas turbines metering shall be installed on each Combined Cycle Gas Turbine Unit for aggregation in Settlement.

7. For transfers between the Distribution System of a Public Electricity Supplier and an ERS First Tier Customer, Second Tier Supplier or Second Tier Customer , the

DMP shall be at the point of connection to the Distribution System of the Public Electricity Supplier.

APPENDIX A cont.

8. For transfers between The National Grid Company plc and a Non-Embedded Customer , the DMP shall be at the point of connection to The National Grid Company plc.

9. For transfers between The National Grid Company plc and Externally Interconnected Parties the DMP shall be as follows:-

(i) For the Scottish links, the busbar side of the busbar disconnectors at:-

(a) Harker 400 kV Substation
(b) Harker 275 kV Substation
(c) Harker 132 kV Substation
(d) Stella 275 kV Substation
(e) Stella 400 kV Substation

(ii) For the EdF link the busbar side of the busbar disconnectors at the Sellindge 400 kV Substation.

APPENDIX B

LABELLING OF METERS FOR IMPORT AND EXPORT

1 A standard method of labelling meters, test blocks, etc. is necessary and based on the definitions for Import and Export the required labelling shall be as follows.

2 ACTIVE ENERGY

Meters or Meter Registers shall be labelled "Import" or "Export" according to the diagram "Figure 1".

This convention is based on "Import" and "Export" being from the viewpoint of the Registrant of the Metering System.

3 REACTIVE ENERGY

Within the context of this code the relationship between Active Energy and Reactive Energy can best be established by means of the power factor. The following table gives the relationship:-

Flow of Active Energy	Power Factor	Flow of Reactive Energy
Import	Lagging	Import
Import	Leading	Export
Import	Unity	Zero
Export	Lagging	Export
Export	Leading	Import
Export	Unity	Zero

Meters or Meter Registers for registering Import Reactive Energy should be labelled "Import" and those for registering Export Reactive Energy should be labelled "Export".

APPENDIX B continued

IMPORT AND EXPORT ACTIVE ENERGY FLOWS FROM THE VIEWPOINT OF THE REGISTRANT.

This convention is based on "Import" and "Export" being from the viewpoint of the Registrant of the Metering System.

Import & Export

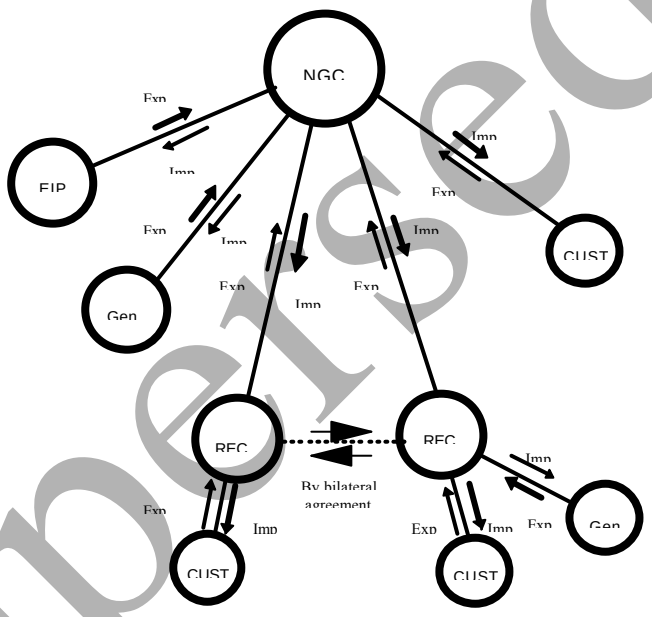


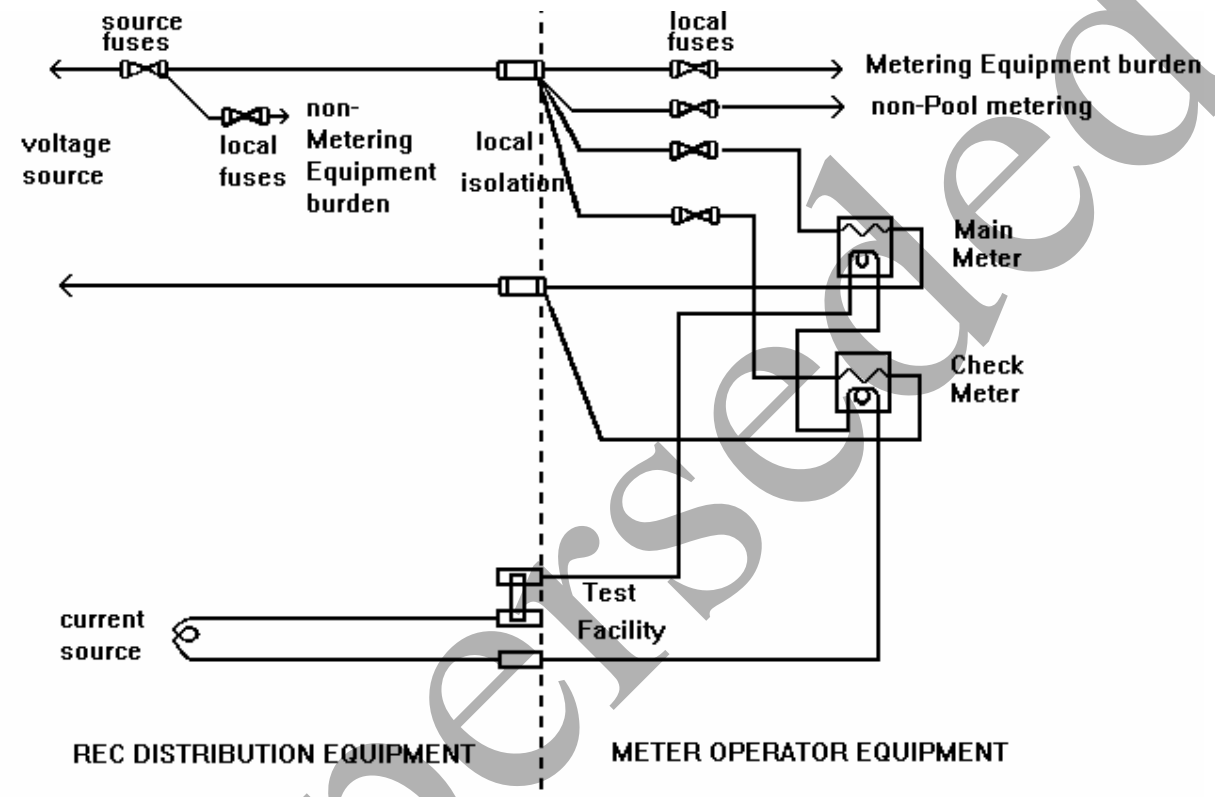
Figure 1

KEY:

NGC - NGC Transmission System (not including any Remote Transmission Asset).
EIP - Scottish Power plc and EDF.
GEN - Directly connected or Embedded Generator.
PES - Public Electricity Supplier.
CUST - Customer whose metering is registered by a Supplier.

APPENDIX C

EXPLANATORY DIAGRAM OF THE INCOMING AND OUTGOING CONNECTIONS TO THE TESTING FACILITIES



APPENDIX D

PASSWORDS

The Passwords specified in Section 5.6 shall be subject to the following additional requirements:-

1. The communications protocol employed shall ensure that the Password offered determines the level of access to the data within the Metering Equipment.

2. A counter logging the number of illegal attempts (i.e. Password comparison failures) to access Metering Equipment via the local and remote ports shall be incorporated into the log-on process. This counter shall reset to zero at every hour change (i.e. 0100, 0200, etc.).

3. If the counter reaches 7, then access is prohibited at all levels until the counter resets at the next hour change.