CODE OF PRACTICE FOUR

CODE OF PRACTICE FOR THE CALIBRATION, TESTING AND COMMISSIONING REQUIREMENTS OF METERING EQUIPMENT FOR SETTLEMENT PURPOSES

Issue 5

Version 4.5

DATE: 4 September 2007

Code of Practice Four

CODE OF PRACTICE FOR THE LIFETIME ACCURACY VERIFICATION OF SETTLEMENT METERING SYSTEMS

1. Reference is made to the Balancing and Settlement Code for the Electricity Industry in Great Britain and, in particular, to the definitions of "Code of Practice" in Annex X-1 thereof.

2. This Code of Practice shall apply to Metering Systems comprising Metering Equipment that are subject to the requirements of Section L of the Balancing and Settlement Code.

3. This Code of Practice has been approved by the Panel.

For and on behalf of the Panel

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AMENDMENT RECORD

ISSUE	DATE	VERSION	CHANGES	AUTHOR	APPROVED
1	3/1/92		Approved by MSC 5/3/92	CoP4 WG	19/3/92 PEC 49/3695
2	15/4/93	1.00	Endorsed by PEC	MSC	
3	26/7/94	1.11	MSC CoP Sub Group	MSC	
4	8/6/95	2.00	MDC Endorsed	MDC	
5	27/3/96	3.00	MDC Endorsed	CoP4 WG	
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5	23/07/07	4.3	Update following DCP IA walkthrough	BSCCo	

[1] "Code Effective Date" means the date of the Framework Agreement.

ISSUE	DATE	VERSION	CHANGES	AUTHOR	APPROVED
5	16/08/07	4.4	Update following 2nd DCP IA walkthrough	BSCCo	
5	04/08/07	4.5	Updated following Expert comment	BSCCo	

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FOREWORD

This Code of Practice Four (CoP4) relates to the requirements for the Calibration, sample Calibration and the Commissioning of Metering Equipment and the maintaining of associated records with respect to the above for Settlement purposes.

This CoP4 defines the minimum requirements that participants must meet when carrying out the above.

The Panel (or its delegated authority) shall retain copies of, amongst other things, this CoP4 together with copies of any and all documents referred to in it, in accordance with the provisions of the Balancing and Settlement Code (the "BSC").

1. SCOPE

CoP4 in respect of Half Hourly Metering Systems states the practices that shall be employed, and the apparatus that shall be used for the Calibration, sample Calibration and Commissioning of Metering Equipment registered with the Central Meter Registration Service (CMRS) or Supplier Meter Registration Service (SMRS) for Half Hourly Metering Systems. It also states the requirements in relation to Codes of Practice 1, 2, 3, 5, 6 and 7 and supersedes any testing requirements contained within the 'Alpha' Codes of Practice (A, B, C, D, E , F, G, H, I, J, K1 and K2). It also states those practices that are applicable in relation to the production and maintaining of associated records as a result of the above mentioned practices.

CoP4 in respect of Non Half Hourly Metering Systems states the practices that shall be employed, and the apparatus that shall be used for the Calibration and Commissioning of Metering Equipment registered with the Supplier Meter Registration Service (SMRS) for Non Half Hourly Metering Systems. It also states those practices that are applicable in relation to the production and maintaining of associated records as a result of the above mentioned practices.

Meters that are to be used for both Supplier billing and Settlement purposes shall comply in all respects with Schedule 7 of the Electricity Act 1989 in addition to the requirements of this CoP4.

It is expected, save in exceptional[2] circumstances, that Metering Dispensations shall not be granted in respect of this CoP4. However, Metering Systems with valid Metering Dispensations against other Codes of Practice shall comply with Calibration frequency, test points and accuracy limits applicable to the registered Code of Practice.

[2] An example of an exceptional circumstance may include, for example, where an order for Metering Equipment was placed before this CoP4 effective date for delivery after this CoP4 effective date, and where the certificates delivered cannot meet the requirements for uncertainty of measurement for all test points required for certain items of Metering Equipment under this CoP4.

The obligations and requirements of this CoP4 are described as being an obligation and requirements on the Meter Operator Agent (MOA) responsible for the Metering System. In respect of some of the requirements the obligation and requirement is described as being against a third party. It is noted however that under the BSC the ultimate responsibility for compliance with this CoP4 is that of the Registrant.

Given the above paragraph it is noted that any and all formal queries, disputes or otherwise that arise in relation to this CoP4 must be raised in accordance with BSC Procedure 27.

This CoP4 derives force from BSC in particular Section L: 'Metering', to which reference should be made. It should also be read in conjunction with any relevant BSC Procedures. In the event of any inconsistency between the provisions of this Code of Practice and the BSC, the provisions of the BSC shall prevail.

It is also to be noted BSCCo is acting under a delegated authority from the Panel and therefore any action, function, obligation or otherwise by BSCCo is such an action, function, obligation or otherwise from the Panel. BSCCo may, when discharging its actions, functions, obligations or otherwise under this CoP4, delegate such action, function, obligation or otherwise to a third party, including but not necessarily limited to the Technical Assurance Agent (as that term is defined in the BSC) or such other independent third party as it sees fit (such third party may also include a MOA).

2. APPLICATION TO OTHER CODES OF PRACTICE

CoP4 specifies the accuracy requirements for Meters including those in which Compensations for measurement transformer errors and/or power transformer line losses have been applied. The accuracy requirements described are either equal to or lower than the equivalent limits applicable to the Metering Equipment, specified in the relevant Code of Practice applicable to each Meter. Where the accuracy requirements are lower the difference is a recognition that in practice the error at the Actual Metering Point or the Defined Metering Point will be greater than the error of the Meter alone.

3. REFERENCES

The following documents should also be referred to when considering this CoP4:-

- Balancing and Settlement Code and in particular Section X; Annex X-1 and Section L as well as any and all applicable BSC Procedures
- United Kingdom Accreditation Service (UKAS) Directive M3003
- Electricity Act 1989 and in particular Schedule 7
- BS EN ISO 9001: 2000: Quality management systems – Requirements
- BS EN ISO/IEC 17025: 2005: General requirements for the competence of testing and calibration laboratories
- BS EN 60044-1: 1999:Instrument Transformers – Part 1 Current transformers
- BS EN 60044-2: 1999: Instrument Transformers – Part 2 Inductive voltage transformers
- BS EN 60044-3: 2003: Instrument Transformers – Part 3 Instrument transformers. Combined transformers
- BS EN 62053-11: 2003: Electromechanical Meters for active energy (Classes 0.5, 1 and 2)
- BS EN 62053-21: 2003: Static Meters for active energy (Classes 1 and 2)
- BS EN 62053-22: 2003: Static Meters for active energy (Classes 0.2S and 0.5S)
- BS EN 62053-23: 2003: Static Meters for reactive energy (Classes 2 and 3)
- Meter Operation Code of Practice Agreement (MOCOPA), version 2.2, dated 9 August 2006 (www.mocopa.org.uk)
- Statutory Instruments 2006 No.1679 (SI1679). Weights and Measures. The Measuring Instruments (Active Electrical Energy Meters) Regulations 2006

4. DEFINITIONS AND INTERPRETATIONS

Save as otherwise expressly provided herein, words and expressions used in this CoP4 shall have the meanings attributed to them in the BSC. The following definitions are included for the purposes of clarification within this document.

Definitions marked with an asterisk (*) are taken from the BSC without modification.

4.1. Accredited Laboratory

The National Physical Laboratory (NPL), or a Calibration laboratory that has been accredited by the United Kingdom Accreditation Service (UKAS), or a similarly accredited international body.

4.2. Actual Metering Point

The physical location at which Electricity is metered.

4.3. Adjustment

Adjustment means in relation to a Meter, any changes made to the Meter's basic accuracy.

4.4. Blank Calibrated Meter

A Blank Calibrated Meter means a Calibrated Meter which has not had Compensation applied.

4.5. Calibration

Calibration means the procedure whereby the relevant errors of any item of Metering Equipment and Standards are determined and recorded.

4.6 Commissioning

Commissioning is a process to ensure that the energy flowing across a Defined Metering Point is accurately recorded by the associated Metering System.

4.7 Compensation

Compensation is an Adjustment deliberately made to the measurement characteristics of a Meter.

4.8 Compensated Meter

A Compensated Meter means a Meter that has Compensation(s) applied to it so as to accurately measure Active Energy or Reactive Energy in the primary circuit in relation to the energy transfer at the Defined Metering Point.

4.9 Defined Metering Point

The physical location as defined in the relevant Code of Practice.

4.10 Electricity *

Electricity - means Active Energy and/or Reactive Energy.

4.11 Meter *

A device for measuring Active Energy or Reactive Energy.

4.12 Meter Type

A manufacturer's model or design to meet an accuracy class based on a particular set of measurement components. Variants within the accuracy class that do not affect the metrology are included within the same type.

4.13 Metering Equipment *

Means Meters, measurement transformers (voltage, current or combination units), metering protection equipment including alarms, circuitry, associated Communications Equipment and Outstation and wiring.

4.14 Outstation *

Equipment which receives and stores data from a Meter(s) for the purpose, inter alia, of transfer of that metering data to the CDCA or a Data Collector, as the case may be, and which may perform some processing before such transfer and may be one or more separate units or may be integral with the Meter.

4.15 Overall Accuracy

Overall Accuracy means the difference between the measured energy and the true energy at the Defined Metering Point after taking account of all Compensations deliberately set into the Meter and is expressed as a percentage of the true energy. The Overall Accuracy criterion for a Metering System is as stated in the relevant Code of Practice.

4.16 Reference Standard

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.

4.17 Reference Temperature

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.

4.18 Standard(s)

Means any of the following: Reference Standards; Transfer Standards; and Working Standards.

4.19 Test House

Means a test facility that is not an Accredited Laboratory.

4.20 Traceable

Traceable means providing an audit trail so as to identify:

a) In relation to Calibration Certificates and documented test results, the body or person responsible for carrying out Calibrations and tests;

b) In relation to sealing equipment, the person responsible for carrying out sealing via sealing plier ID; and

c) In relation to Calibration equipment, that such equipment has been tested against identified Standards held by a Test House or an Accredited Laboratory.

4.21 Transfer Standard

Transfer Standard means Standard, including a complete Metering Equipment testing system, which has been verified by comparison to a Reference Standard, and can be used for the Calibration of Metering Equipment.

4.22 Working Standard

Working Standard means a Standard, including a complete Metering Equipment testing system, which has been verified by comparison to either a Reference Standard or a Transfer Standard, and is used for the Calibration of Metering Equipment.

5 HALF HOURLY METERING SYSTEMS

This CoP4 covers the requirements for Meter Calibration, Calibration of existing installed Meters, sample Calibration for new Meter Types, Calibration of measurement transformers, Commissioning, production and maintenance of the requisite records for each of these activities. It covers Metering Equipment complying with Codes of Practice 1, 2, 3, 5, 6, 7 and Codes of Practice A to K2.

5.1 Meters – Calibration

5.1.1 Types of Calibration

The different types of Calibration carried out are:

- A Type A Calibration is an initial Calibration carried out under reference conditions prior to installation;
- A Type B Calibration is a periodic Calibration carried out to indicate no adverse impact on accuracy over time; and
- A Type C Calibration is a periodic Calibration, similar to Type A, but not necessarily under reference conditions.

Meter Calibration shall be carried out in accordance with those dates/frequencies as stated in Appendix A and at the test points as described in Appendix B. The measured errors for such Meter Calibrations shall not exceed those measured errors that are detailed in Appendix C with such measurement uncertainties not exceeding those stated in Appendix D.

Meters that, as a result of Calibration, are found to be outside the required accuracy limits should be either replaced or Adjusted and re-Calibrated until CoP4 compliant accuracy is achieved[3]

Phase-advanced Reactive hour (PARh) Meters shall be calibrated as per a reactive Class 2 Meter as per Tables C3, D3 and D4.

Where Compensation is to be applied to a Blank Calibrated Meter by means of software, a quality assurance system covering such operations shall be in place to ensure that the Compensation is properly applied. Evidence of such quality assurance system and its use will be made available to the BSCCo on request. In all other cases the Meter shall be re-Calibrated using a Type C Calibration after Compensation is applied to ensure that the relevant Code of Practice overall accuracy requirement is met before return to service.

[3] Meters found to be outside the defined limits of accuracy shall be considered faulty and shall be dealt with as such in accordance with the requirements of the relevant BSCP and/or Party Service Line.

5.1.2 Meter Calibration Criteria

Meters installed after the effective date of CoP4 Issue 5, Version 4.5 shall be Calibrated using Standards that comply with this CoP4 so as to demonstrate compliance of that Meter with the accuracy requirements of the relevant Code of Practice.

It is important that the Calibration of Meters be undertaken using accurate test equipment so that the measurement uncertainty is no greater than the values shown in Appendix D.

5.1.2.1 Type A Calibration

A Type A Calibration shall be carried out to the relevant product standard.

In most cases it is the manufacturer who will carry out Type A Calibration and deliver the Meter with a Certificate indicating conformity with the accuracy requirements appropriate to the Meter's Class (that is, according to the relevant product standard BS EN 62053-21 (Active static Meters of Classes 1 and 2), 62053-22 (Active static Meters of Classes 0.2S and 0.5S) or 62053-23 (Reactive static Meters of Classes 2 and 3)). Such Certificates shall for the purposes of this CoP4 be referred to as a Type A Calibration Certificate.

A Type A Calibration will be conducted using the Meter's metrological test output. However, for at least one load point, it shall also be confirmed that the physical display and the pulse output, where used for Settlement purposes, are registering to the required accuracy, i.e. all outputs fitted provide the same measurement result.

The Type A Calibration Certificate shows the tests conducted and the results of those tests as given in Appendix B. Such tests will be performed either:

- On Meters that have been fully configured for use, including any Compensation to correct the Meter registration for external measurement errors and Plant losses; or
- With a Blank Calibrated Meter, with the intention that a Compensation characteristic will subsequently be applied.

5.1.2.2 Type B Calibration

Type B Calibrations permit the extension of the period between Type A and Type C Calibrations by the instigation of an in-service testing regime. These tests may be conducted on site.

5.1.2.3 Type C Calibration

A Type C Calibration is required after the Meter has been in service for a period of time. These tests may be carried out at a Test House, an Accredited Laboratory or on site. While the test points are a subset of those which apply to Type A Calibrations, the relevant uncertainties as provided in Appendix D are independent of where the Calibration is performed.

For Code of Practice 1 & 2 Meters only, the frequency of Type C Calibrations is dependent on whether Type B Calibrations are also employed (see Appendix A).

5.1.2.4 Calibration of 'existing installed' Code of Practice 1 and 2 Meters

For existing Meters for Code of Practice 1 and 2 installations that have been installed for at least 5 years prior to effective date of Issue 5, Version 4.5 of CoP4, the following requirement replaces the need for both sample and periodic calibrations and the following Calibration frequency and sample size requirements shall apply:

For a 10 year period from the effective date of Issue 5, Version 4.5 of CoP4, at least 20% of the total of each such type of Meter shall be Type C calibrated without Adjustment and the results of such Calibration shall be recorded. Any Meter that is found to be outside of the required accuracy must either be replaced or Adjusted and re-Calibrated until CoP4 compliant accuracy is achieved; The frequency requirements mentioned above replace the Type B and C Calibration periods as stated in Appendix A. Any test undertaken during the transition period (whether type B or C) will correspond to the first Bc or C test as described in Appendix A. All subsequent tests shall be to the subsequent intervals and test types in Appendix A. It should be noted that after ten (10) years from the effective date of Issue 5, Version 4.5 of CoP4, all Meters shall comply with the requirements of Appendix A.

For the avoidance of doubt any Code of Practice 1 or 2 Meters installed in the five years preceding the effective date of Issue 5, Version 4.5 of CoP4 must comply with the Calibration requirements in Appendix A.

5.1.2.5 Transitional Arrangements for Periodic Calibrations for Existing CoP3, 5, 6 and 7 Meters

The first periodic Calibration under these requirements will be determined by the type and date of the previous Calibration. Further periodic Calibrations shall be performed in accordance with Appendix A.

- Where the last calibration is an initial calibration (equivalent to a type A Calibration) a type B Calibration shall be performed within 15 years of the date of the initial Calibration.
- Where the last Calibration is a CoP4 test (equivalent to a type B Calibration) a type C Calibration shall be preformed within 5 years of CoP4 test.

5.1.2.6 Transitional Arrangements for Periodic Calibrations for existing CoP1 and 2 Meters

On the 10th anniversary of this CoP4 Issue 5 version 4.5 all CoP1 and 2 Meters shall be subject to the requirements for the periodic Calibrations of this CoP4 Issue 5 version 4.5 and the Calibration periods shall commence from year zero of Appendix A save for the requirement to perform a type A Calibration.

5.1.3 Sealing

Meters should be sealed immediately after Calibration and prior to leaving the test facility. Sealing may include the use of a paper seal provided and fitted by the test facility or will be in accordance with BSCP06 'Notification and Sealing of Metering Equipment for Central Volume Allocation', or BSCP514 'SVA Meter Operators for Metering Systems registered in SMRS' as appropriate.

5.1.4 Records

5.1.4.1 Calibration Certificates

Evidence shall be produced and maintained for the Metering Equipment of any relevant Calibrations conducted. This evidence shall be in the form of a Certificate (and for the purpose of this CoP4, it shall be referred to as Calibration Certificate when referencing all types of Calibration Certificates). Calibration Certificates shall either be in the form of Traceable Certificates of conformance to an accuracy class, or actual errors determined through Calibration. For Metering Equipment installed after the effective date of Issue 5, Version 4.5 of CoP4 the results shall include a measurement uncertainty value which shall be determined to a confidence level of 95% or greater in accordance with the UKAS Directive M3003.

The Calibration Certificates shall identify the serial number and type of Meters Calibrated, the name of the testing body, the location of the Calibrations, and the date on which the Calibrations were concluded and where appropriate, the measurement uncertainties.

For existing Type A Calibration Certificates where there is no explicit Calibration date listed, it shall be deemed to be the date of manufacture for the Meter. Calibration Certificates shall identify the body responsible for the Calibrations.

From the effective date of Issue 5, Version 4.5 of CoP4, manufacturers' Certificates, and the Certificates providing results of additional Calibrations, shall include statements of the measurement uncertainties covering all measurement points.

The Calibration Certificates that apply to Metering Equipment installed after the effective date of Issue 5, Version 4.5 of CoP4 may be held as either hard paper copies, or in non-editable electronic format.

All Calibrations shall be conducted to the relevant Standards as required in this CoP4 and the Calibration Certificates shall contain information that relates to the Standard applied. In addition, the Calibration Certificates shall reference the Calibrations to which they apply.

For Code of Practice 1 and 2 Meters, Calibration Certificates should be retained for the lifetime of the Meter.

For Codes of Practice 3, 5, 6, and 7, as a minimum for the purposes of this Code of Practice 4, retain the following Calibration Certificates evidencing:

The latest type A Calibration;
The latest type C Calibration (if any); and
The latest type B Calibration if later than the latest type A or C Calibration undertaken.

Calibrations can be performed on either a Blank Calibrated Meter, or a Compensated Meter. The method chosen shall be recorded on the Calibration Certificate.

Save as for the provisions for Calibration Certificates for Codes of Practice 3 and 5 above, evidence shall be retained and made available as and when required, such as to satisfactorily provide an audit trail evidencing that Calibration activity has been carried out in a timely manner and in accordance with the relevant Code of Practice.

Where no Calibration Certificate is available, the MOA should inform BSCCo and upon instruction from BSCCo, the MOA should carry out a Type C Calibration.

5.1.4.2 Annual Calibration Report

For Type B and Type C Calibrations, the MOA shall provide an annual report to BSCCo. The format of this report is given in Appendix E. BSCCo shall collate and report the findings to the Panel. It should be noted that certain elements of information provided in this annual report may be distributed to third parties in a non-confidential manner however a fully disclosed version of the annual report shall be may available to the Panel.

5.1.4.3 Inspection of Certificates, records and testing

Each MOA shall make available on request to BSCCo all relevant Certificates[4], records and procedures relating to this Code of Practice.

Save as in respect of Codes of Practice 3 and 5 as referred to in Section 5.1.4.1 'Calibration Certificates', the results of all Calibrations and sampling tests performed on Meters shall be retained as Traceable records.

5.1.4.4 Quality Assurance

The Meter Operator Agent shall ensure that a quality assurance system shall be in place by an Accredited Laboratory or Test House which covers the activities and equipment

[4] Where Certificate are not available, refer to Section 5.1.4 for Meter Certificates or Section 5.3.3 for measurement transformer Certificates.

used for Calibration in the Accredited Laboratory or Test House and for sample Calibrations (see 5.2 below).

BSCCo shall have the right to establish confidence in any quality assurance system which is not in accordance with BS EN ISO/IEC 17025 but otherwise demonstrates quality levels in accordance with BS EN ISO 9001 or an equivalent standard. BSCCo may recover any reasonable additional cost so incurred by it from the MOA.

Each Registrant shall ensure that the relevant records relating to quality assurance are made available on request to BSCCo for review and confirmation.

5.2 Sample Calibrations

As well as the periodic Calibration requirements stated in Section 5.1, MOAs shall perform sample Calibrations.

BSCCo shall identify annually the Meter types to be sample Calibrated over the following 5 years.

A sample Calibration will involve the undertaking of a Type B Calibration.

The Meter Operator Agent shall sample at least 1% of each Meter Type as identified by BSCCo per annum; starting from year 8 after the Meter has undertaken a Type A Calibration[5].

The MOA shall provide an annual report to BSCCo on the Meters Calibrated. This annual report shall contain information on the number of Meters sampled per Meter Type, the timescale since the Meter underwent a Type A Calibration, whether the Meter was found to be within prescribed accuracy limits, together with the number of Meters that were found to be outside of prescribed limits (and their measured accuracies). The format for this annual report is contained in table E2 of Appendix E.

Evidence shall be retained and made available as and when required, so as to provide a satisfactory audit trail, showing that sample Calibration have been carried out in a timely manner and in accordance with the relevant Code of Practice.

[5] Where the MOA is carrying out Type B Calibrations as part of their routine procedures these may contribute to the total number of Sample Calibrations required in that year.

5.3 Measurement Transformers

5.3.1 Initial Calibration

Measurement transformers shall be Calibrated prior to initial installation. Evidence thereof will be made available to the BSCCo on request.

For multi-ratio Current Transformers and Voltage Transformers, the transformer shall be Calibrated, as a minimum, for the ratio that is to be used for Settlement purposes.

The Calibration is required to demonstrate compliance with the BS EN 60044-1 and/or (as appropriate) BS EN 60044-2 and/or (as appropriate) BS EN 60044-3 accuracy and measurement range requirements, as appropriate for the measurement transformer's class index.

For Certificates produced after the effective date of Issue 5, Version 4.5 of CoP4, the accuracy test results shall include a measurement uncertainty value which shall be determined to a confidence level of 95% or greater in accordance with the UKAS Directive M3003. In the case of measurement transformers for Code of Practice 1 and 2 applications the accuracy test result errors including measurement uncertainty shall not exceed 1.5 times the permitted errors in the relevant specifications involved (i.e. BS EN 60044-1, BS EN 60044-2 and BS EN 60044-3).

5.3.2 Periodic Calibration

Periodic Calibration and sampling are not required for measurement transformers.

5.3.3 Records

All records of Calibration for measurement transformers (as detailed above) shall be held in the form of Traceable Certificates and for Certificates produced after the effective date of Issue 5, Version 4.5 of CoP4 shall be complete with statements of measurement uncertainties covering all test points. This may be single value covering the entire range of test points or a series of values covering discrete ranges as appropriate.

It is noted however that for existing measurement transformers (installed prior to the effective date of Issue 5, Version 4.5 of CoP4) where the initial Calibration Certificate is missing but where such information relating to the same is listed in the national measurement transformer error statement (as published by BSCCo from time to time), then those stated errors shall be applicable.

The requirements for inspection of Calibration Certificates, technical audit and quality assurance as detailed in sections 5.1.4.3-5.1.4.5 shall equally apply to measurement transformers.

For existing measurement transformers (manufactured prior to the effective date of Issue 5, Version 4.5 of CoP4), Parties may, in exceptional circumstances, apply to BSCCo regarding the requirements for inspection of Certificates, technical audit and quality assurance and provide other types of evidence as to the accuracy of the measurement transformer.

5.4 Voltage failure alarm

Where the relevant Code of Practice requires voltage failure alarm functionality and the alarm is not provided in the Meter, a check must be performed to ensure proper operation of the alarm including any remote notification, on installation and each time the Meter is calibrated with a Type B and/or a Type C Calibration. Records must be kept by the MOA for each voltage failure alarm check.

If a failure is identified it must be rectified as appropriate.

5.5 Commissioning

The purpose of Commissioning is to ensure that the energy flowing across a Defined Metering Point is accurately recorded by the associated Metering System. The following tests and checks are provided to Commissioning engineers to help ensure this requirement is met (the detail involved in the tests and checks carried out will largely depend on the quantities of energy measured by the associated Metering System).

Commissioning shall be performed on all new Metering Equipment which is to provide metering data for Settlement.

5.5.1 Instruments for Commissioning

The MOA shall establish and maintain a process to periodically Calibrate the instruments used for Commissioning (from which measurements are recorded). Each instrument shall be traceable (e.g. have a serial number). The MOA shall maintain records to show the instruments used for Commissioning, when an instrument was last Calibrated, and when it is next due for Calibration.

The period of Calibration shall be determined by the MOA, depending on the type of instrument used and manufacturer's recommendations, but in any event not exceed 2 years.

5.5.2 Commissioning Tests

Commissioning tests on site shall be performed to confirm and record where appropriate the following:

- That the current transformers are of the correct ratio and polarity and correctly located to record the required power flow;
- The voltage transformers are the correct ratio and polarity and correctly located to record the required power flow;

- The relationships between voltages and currents are correct and that phase rotation is standard at the Meter terminals;
- The burdens on the measurement transformers are within the correct limits;
- The Meters have the correct Compensation for errors in the measurement transformers/connections and losses in power transformers where appropriate;
- The output of the Metering System correctly records the energy in the primary system at the Defined Metering Point.

Where individual items of Metering Equipment are to be replaced, Commissioning of those items only are required to be commissioned. For clarification, Metering Systems in their entirety need not be re-Commissioned when items are replaced within that system.

5.5.3 Sealing

At the completion of Commissioning, Metering Equipment shall be sealed in accordance with the requirements of BSCP 06 and BSCP 514 as appropriate.

5.5.4 Records

The MOA shall provide such evidence, as BSCCo may require, to confirm that, following its Commissioning, Metering Equipment shall meet the requirements of the Code and relevant Codes of Practice. This evidence must be traceable and dated.

If Metering Equipment is changed, then its Commissioning record should be retained by the MOA and provided to BSCCo if required.

The evidence provided shall contain, as a minimum and where applicable, the following information:

- Site name
- Site address
- Metering System Identifier (MSID/MPAN)
- Meter Operator Agent organisation name
- Date of Commissioning
- Name of person responsible for undertaking Commissioning (and organisation)
- Reason for Commissioning
- Code of Practice applicable (including version)
- Metering Dispensations applicable
- Meter details (including any Certificate identity)
- Current Transformers details (including any Certificate identity)
- Voltage Transformers details (including any Certificate identity)
- Circuit name (where more than one)
- Results of inspections, tests and observations.

5.6 Proving

In order to ensure that the metering data recorded by the Metering Systems Outstation(s) can be transferred to Settlements, a Proving Test shall be performed in accordance with BSC Procedures 514 or 02 as appropriate.

6 Non Half Hourly Metering Systems[6]

6.1 Commissioning

The purpose of Commissioning is to ensure that the energy flowing across a Defined Metering Point is accurately recorded by the associated Metering System. The following tests and checks are provided to Commissioning engineers to help ensure this (the detail involved in the tests and checks carried out will largely depend on the quantities of energy measured by the associated Metering System).

Commissioning shall be performed on all new Metering Equipment which is to provide metering data for Settlement.

Where replacement Metering Equipment is fitted as part of an existing Metering System Commissioning covering the changes shall also be conducted.

6.2 Commissioning Tests

Commissioning tests on site shall be performed to confirm and record where appropriate the following:

- That the current transformers are of the correct ratio and polarity and correctly located to record the required power flow;
- For multi phase installations the relationships between voltages and currents are correct and that phase rotation is standard at the Meter terminals;
- The burdens on any measurement transformers are within the correct limits;
- The output of the Metering System correctly records the energy in the primary system at the Defined Metering Point.

Where individual items of Metering Equipment are to be replaced, Commissioning of those items only are required to be commissioned. For clarification, Metering Systems in their entirety need not be re-Commissioned when items are replaced within that system.

[6] This section is provided to cover the requirements for commissioning and in-service testing of non-half hourly Metering Equipment. In respect of in-service testing of Meters certified under the Electricity Act, the requirements of the national sample survey will apply until 2016. The requirements for in-service testing of MID approved (under SI1679) Meters will be populated to this section once they are agreed.

7 Calibration Equipment for Meters

It is important that confidence must be established in the organisations which calibrate Meters and/or in the processes/equipment that are used to calibrate Meters. Three approaches can be used to establish traceability to national Standards of accuracy. The party performing the Calibration must either:

i. Have third party accreditation for all Calibration equipment and procedures, the third party being a recognised certification body such as UKAS or a European/international equivalent. Alternatively, audited conformity with BS EN ISO/IEC 17025 for all equipment and procedures will be a presumption of competence; or

ii. Have partial third party accreditation for use of certain Standards, e.g. through Ofgem/supporting agent and can demonstrate they have similar procedures for use of other Standards to follow the requirements detailed in Section 7 and audited by BSCCo; or

iii. Directly comply with all the requirements detailed in Section 7 and audited by BSCCo.

Three types of Standards are used to establish traceability. Transfer Standards are mainly used as a means to transfer the accuracy of a Reference Standard, to a standard used in practice; the Working Standard.

7.1 Reference Standards

7.1.1 Temperature tolerance

7.1.1.1 Reference Standards shall be maintained at the appropriate Reference Temperature. The effect of temperature variations shall be allowed for in the uncertainty budgets.

7.1.2 Calibration intervals

7.1.2.1 Reference Standard(s), other than Reference Standard current transformers and voltage transformers that are not maintained in accordance with UKAS requirements, shall, unless its measurement traceability is maintained by radio communication, be verified at an Accredited Laboratory at intervals dependent on the specification(s) but in no case less frequently than at intervals of 24 months.

7.2. Transfer Standards

7.2.1 Temperature tolerance

7.2.1.1 Transfer Standards shall be maintained at the appropriate Reference Temperature. The effect of temperature variations shall be allowed for in the uncertainty budgets.

7.2.2 Calibration intervals

7.2.2.1 Transfer Standards shall be verified at an Accredited Laboratory or against a Reference Standard, at intervals dependent on their specifications but in no case less frequently than at intervals of 6 months.

7.2.2.2 Parties may apply to BSCCo, with supporting evidence[7], such that the interval between such Calibrations can be increased to a maximum of 12 months.

7.2.3. Outside specification

7.2.3.1 When a Transfer Standard is Calibrated and is found to be outside its specification, BSCCo shall be promptly notified and action shall be taken by the Party to remedy the situation. Notification shall be given to BSCCo of the details and results of any investigation. The results of the investigation shall, amongst other things, show:-

(a) whether Metering Equipment Calibrated using that Standard since its last satisfactory Calibration complies with the relevant Code of Practice;

(b) the reason why that Standard is outside its specification.

7.3. Working Standards

7.3.1 Temperature tolerance

7.3.1.1 Save in so far as it is necessary to comply with the accuracy requirements of this Code of Practice, Working Standards need not be maintained at a given temperature. The effect of temperature variations shall be allowed for in the uncertainty budgets.

7.3.2 Calibration intervals

7.3.2.1 Working Standards need not be verified at an Accredited Laboratory provided that they have been Calibrated in accordance with 7.3.2.2 or 7.3.2.3.

7.3.2.2 Working Standards shall be Calibrated against Reference Standards or Transfer Standards at 3 monthly intervals.

7.3.2.3 Where evidence is made available to BSCCo, Parties may apply to BSCCo with such evidence for the extension of the interval period up to a maximum of 12 months.

[7] An example of the evidence that may be considered by BSCCo to support an application can be found in the CoP4 Guidance document on the BSCCo website at www.elexon.co.uk.

7.3.3 Outside specification

7.3.3.1 When a Working Standard is Calibrated and is found to be outside its specification, BSCCo shall be promptly notified and action shall be taken by the Party to remedy the situation. Notification shall be given to BSCCo of the details and results of any investigation. The results of the investigation shall, amongst other things, show:-

(a) whether Metering Equipment Calibrated using that Standard since its last satisfactory Calibration complies with the relevant Code of Practice;

(b) the reason why that Standard is outside its specification.

7.4 Records

7.4.1 All Certificates for new Metering Equipment[8] and Calibration equipment used must be produced using verifiable Standards.

7.4.2 Such records shall include an overall accuracy and uncertainty of measurement statement for the relevant Standard. Uncertainty will normally be determined as per the current UKAS Directive M3003 but any other suitable method may be used as agreed with BSCCo.

8 Calibration Equipment for Measurement Transformers

It is important to note that confidence must be established in the organisations which calibrate current and voltage transformers. This is of particular importance to measurement transformers as they do not undergo any periodic Calibrations (as for Meters). Two approaches can be used to establish traceability to national Standards of accuracy. The party performing the Calibration must at the time of Calibration either:

i. Have an accreditation for all Calibration equipment and procedures from a recognised certification body such as UKAS or a European/international equivalent. Alternatively, conformity with BS EN ISO/IEC 17025 for all equipment and procedures will be a presumption of competence; or

ii. Directly comply with all the requirements detailed in Section 7.1-7.3 and be subject to audit as necessary.

Where 8 (ii) applies, the purchaser of the Metering Equipment shall use reasonable endeavours to ensure and record that the Calibration equipment used by the manufacturer satisfies the accuracy Standards set out in CoP4.

[8] Brought into use after Issue 5, Version 4.5 of CoP4 is effective.

8.1 Reference Standards

8.1.1 Temperature tolerance

8.1.1.1 Save as is necessary to meet the accuracy requirement of this Code of Practice, reference Standard current transformers and voltage transformers need not be maintained at a Reference Temperature where it is impracticable.

8.2 Calibration intervals

8.2.1 Reference Standard current transformers and voltage transformers shall be Calibrated by an Accredited Laboratory at intervals not exceeding 5 years. Where evidence is made available to BSCCo, Parties may apply to BSCCo, with such supporting evidence, for the extension of the interval period.

8.2.2 Records

8.2.3 All Certificates for new measurement transformers[9] must be produced using verifiable Standards and Calibration equipment used must operate according to these Standards.

8.2.4 A Traceable record of each Calibration Standards employed in relation to Calibration Equipment under this CoP4 shall be maintained by the Test House.

8.2.5 Such records shall include an overall accuracy and uncertainty of measurement statement for the relevant Standard. Uncertainty should be determined using the UKAS directive M3003.

[9] Registered after Issue 5, Version 4.5 of CoP4 is effective.

APPENDICES

APPENDIX A. CALIBRATION PERIOD TABLE

Period Table A1

Dates shown indicate maximum periods within which Calibrations must be carried out – year 0 relates to the initial or Type A Calibration. Although it is feasible to delay Calibrations until the year in which they are due, due consideration should be given by the MOA to a phased program of Calibrations.

ACTIVE METER

By Year	0	5	10	15	20	25	30	35	40
CoP1 & CoP2	A	-	C	-	C	-	C	-	C
		Bm[10]	Bc	Cm + Bc	Bm	Bc	Cc + Bm	Bm	Bc
CoP3, 5, 6 & 7	A	-	-	B	C	B	B	B	C

The Calibration Types and periods for CoP1 and 2 Active Meters may either be conducted by performing Type C Calibrations at 10 year intervals as shown in row 1 or, alternatively, the Calibration Types and periods highlighted in row 2 may be used.

Wherever main Meter and check Meter is not specified then both main and check shall be Calibrated.

For reactive CoP1 and CoP2 Meters, the intervals between Calibrations are twice those for Active CoP1 and CoP2 Meters.

Phase-advanced Reactive hour (PARh) Meters shall be calibrated as per a reactive Class 2 Meter as per Tables C3, D3 and D4.

For reactive CoP3 and CoP5 Meters, the intervals between Calibrations are the same as those for active CoP3 and CoP5 Meters.

[10] This table row shows that a Type C Calibration is performed on the main Active Meter at year 15 in addition to a Type B Calibration on the check Active Meter. This test is repeated at year 30 but with the main and check Active Meters interchanged with respect to the Type of test required. However the Type of tests required at year 15 on main and check Active Meters may be reversed (i.e. Cc + Bm) from that shown in the table above providing that the reversal is also repeated at year 30 (i.e. Cm + Bc).

Where the reactive Meter is combined with the active Meter then frequency should be the same as for active Meter Calibrations. In the case of 4 quadrant Meters, based upon digital multiplex techniques, reactive Calibration is not necessary provided and it is covered by active Calibration activity.

APPENDIX B. TEST POINTS

Meter Calibrations should be performed at the test points (values of currents) indicated in the following tables. The measured errors at these test points should not exceed the percentage error limits stated in the tables in Appendix C. Where a test point is outside the range of the value of current given in the relevant table in Appendix C, the percentage error limit shall be taken from the percentage error limit from the value of current closest to the test point value.

For example, a test point of $0.01I_n$ (rated current) at unity Power Factor for Type A Calibration for Class 1 Meter will have an associated percentage error limit of +/- 1.5% (taken from Table C1, $0.02\ I_n \leq I < 0.05\ I_n$).

It should be noted that I_n refers to the rated current of a transformer operated Meter and I_b refers to the basic current of a whole current Meter.

1. Type A Calibration Test Points

Table B1. Type A Meter Calibrations for Codes of Practice 1 and 2

Test Point	Active Meter			Reactive Meter		
Value of current (I)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
$0.01I_n$	X					
$0.02I_n$		X	X			
$0.05I_n$	X (3), Y			X, Y		
$0.1I_n$		X	X		X	X
$1.0I_n$	X (2), Y (5)	X (4)	X	X (b), Y	X	X
$1.0I_m$ or $1.2I_n$ or $1.5I_n$ or $2.0I_n$**	X (1)	X	X	X	X	X
1.0 I_n Export~	X (a)					

Notes:
~Bi-directional Meters shall have the tests performed for both Import and Export unless the same measurement element is used for both Import and Export in which case one test only is required.
X= all elements combined
Y = each element on its own
*Tests at 0.5 capacitive Power Factor are acceptable
** Determined by overload capacity of circuit. If unspecified test at I_m

Numbers in brackets identifies for reference only, those tests specified in Statutory Instrument No 1566.

Table B2. Type A Meter Calibrations for Codes of Practice 3, 5, 6 and 7

Test Point	Active Meter		Reactive Meter (CoP 3 and 5 Only)
Value of current (I)	System Power Factor		System Power Factor
	Unity	0.5 inductive	Zero
0.05 I_b/I_n	X (3)		
1.0 I_b/I_n	X (2), Y (5)	X (4), Y (6)	X (b)
1.0 I_m	X (1)		

Notes:
Bi-directional Meters shall have the tests performed for both Import and Export unless the same measurement element is used for both Import and Export in which case one test only is required.
X = all element combined.
Y = each element on its own.

Numbers in brackets identifies for reference only, those tests specified in Statutory Instrument No 1566.

2. Type B Calibration Test Points

Table B3. Type B Meter Calibrations for Codes of Practice 1 and 2

Test Point	Active Meter			Reactive Meter		
Value of current (I)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
0.05I_n	X			X		
0.1I_n		X	X		X	X
1.0I_m or 1.2I_n or 1.5I_n or 2.0I_n**	X	X	X	X	X	X

Notes:
These tests shall be carried out for Import/Export directions, as registered with the CDCA for a given metering point.
X= all elements combined
*Tests at 0.5 capacitive Power Factor are acceptable
** Determined by overload capacity of circuit. If unspecified test at I_m

Type B Meter Calibration for Codes of Practice 3, 5, 6 and 7

For Codes of Practice 3, 5, 6 and 7:

1. Calibrate at prevailing load when the load current > 0.1I_n (or > 0.1I_b for whole current Meters) and Power Factor > ± 0.8; or

2. Calibrate using an injection test when the load current < $0.1I_n$ (or < $0.1I_b$ for whole current Meters) and/or Power Factor < ± 0.8. The injection test shall use as a minimum 1 test point at a current of > $0.1I_n$ (or > $0.1I_b$ for whole current Meters) and Power Factor > ± 0.8.

3. Only the Active Meter needs to be tested for type B Meter Calibrations.

3. Type C Calibration Test Points

Table B4. Type C Meter Calibrations for Codes of Practices 1 and 2

Test Point	Active Meter			Reactive Meter		
Value of current (I)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
$0.01I_n$	X					
$0.02I_n$		X	X			
$0.05I_n$	X,Y			X,Y		
$0.1I_n$		X	X		X	X
$1.0I_m$ or $1.2I_n$ or $1.5I_n$ or $2.0I_n$**	X	X	X	X		

Notes:
Bi-directional Meters shall have the tests performed for both Import and Export
X= all elements combined
Y = each element on its own
*Tests at 0.5 capacitive Power Factor are acceptable
** Determined by overload capacity of circuit. If unspecified test at I_m

Table B5. Type C Meter Calibrations for Codes of Practices 3, 5, 6 and 7

Test Point	Active Meter		Reactive Meter (CoP 3 and 5 Only)
Value of current (I)	System Power Factor		System Power Factor
	Unity	0.5 inductive	Zero
$0.05I_n$	x (3)		
$1.0\ I_b/I_n$	X (2), Y (5)	Y (6)	X (b)
$1.0\ I_m$	X (a)		

Notes:
Bi-directional Meters shall have the tests performed for both Import and Export
Y = each element on its own.

APPENDIX C. MEASURED ERRORS

The following tables state the percentage error limits for each Class of Meter and include both whole current Meters and CT/VT operated Meters. Reference should be made to the relevant Code of Practice for the minimum Meter Class accuracy requirements.

It should be note that I_b refers to basic current of a whole current Meter, I_n to the rated current of a transformer operated Meter and I_{max} to the maximum current rating of a Meter.

Phase-advanced Reactive hour (PARh) Meters shall be calibrated as per a reactive Class 2 Meter as per Tables C3, D3 and D4.

Accuracy Tables for Active Meters

Table C1. Summary of Class accuracy requirements for Class 0.5 (CoP 2), Class 1 (CoP 3) and Class 2 (CoP 5)

Value of current (I)		Power factor	Percentage error limits for Meters of Class		
For whole current Meters	For transformer operated Meters		0.5	1	2
$0.05\ I_b \le I < 0.1\ I_b$	$0.02\ I_n \le I < 0.05\ I_n$	1	+/- 1.0	+/-1.5	+/- 2.5
$0.1\ I_b \le I \le I_{max}$	$0.05\ I_n \le I \le I_{max}$	1	+/- 0.5	+/-1.0	+/- 2.0
$0.1\ I_b \le I < 0.2\ I_b$	$0.05\ I_n \le I < 0.1\ I_n$	0.5 inductive	+/- 1.3	+/- 1.5	+/- 2.5
		0.8 capacitive	+/- 1.3	+/- 1.5	-
$0.2\ I_b \le I \le I_{max}$	$0.1\ I_n \le I \le I_{max}$	0.5 inductive	+/- 0.8	+/- 1.0	+/- 2.0
		0.8 capacitive	+/- 0.8	+/- 1.0	-

Source: BS EN 62053 – 11 and BS EN 62053 - 21

Table C2. Summary of Class accuracy requirements for Class 0.2S (CoP1) and Class 0.5S (CoP 2)

Value of current (I)	Power factor	Percentage error limits for Meters of Class	
		0.2S	0.5S
$0.01\ I_n \le I < 0.05 I_n$	1	+/- 0.4	+/- 1.0
$0.05\ I_n \le I \le I_{max}$	1	+/- 0.2	+/- 0.5
$0.02\ I_n \le I < 0.1 I_n$	0.5 inductive	+/- 0.5	+/- 1.0

	0.8 capacitive	+/- 0.5	+/- 1.0
$0.1\ I_n \leq I \leq I_{max}$	0.5 inductive	+/- 0.3	+/- 0.6
	0.8 capacitive	+/- 0.3	+/- 0.6

Source: BS EN 62053 - 22

Accuracy Tables for Reactive Meters

Table C3. Summary of Class accuracy requirements for Class 2 (CoP 1) and Class 3 (CoP 2, 3 and 5)

Value of current (I)		Sin Ø	Percentage error limits for Meters of Class	
For whole current Meters	For transformer operated Meters		2	3
$0.05\ I_b \le I < 0.1\ I_b$	$0.02\ I_n \le I < 0.05\ I_n$	1	+/- 2.5	+/- 4.0
$0.1\ I_b \le I \le I_{max}$	$0.05\ I_n \le I \le I_{max}$	1	+/- 2.0	+/- 3.0
$0.1\ I_b \le I < 0.2\ I_b$	$0.05\ I_n \le I < 0.1\ I_n$	0.5 inductive or capacitive	+/- 2.5	+/- 4.0
$0.2\ I_b \le I \le I_{max}$	$0.1\ I_n \le I \le I_{max}$	0.5 inductive or capacitive	+/- 2.0	+/- 3.0
$0.2\ I_b \le I \le I_{max}$	$0.1\ I_n \le I \le I_{max}$	0.25 inductive or capacitive	+/- 2.5	+/- 4.0

Source: BS EN 62053 - 23

APPENDIX D. MEASUREMENT UNCERTAINTY

Table D1: Active Meters (Type A and C Calibrations[11])

Phase-advanced Reactive hour (PARh) Meters shall be calibrated as per a reactive Class 2 Meter as per Tables C3, D3 and D4.

Maximum overall uncertainty of Calibration equipment	Class of Meter under test			
	0.2	0.5	1	2
Measurements at unity power factor	+/- 0.06%[1]	+/- 0.1%[2]	+/- 0.4%	+/- 0.4%
Measurements at other than unity power factor	+/- 0.12%	+/- 0.2%	+/- 0.6%	+/- 0.6%

[1] +/- 0.1% for measurements at load points below $0.05I_n$

[2] +/- 0.2% for measurements at load points below $0.05I_n$ for Class 0.5S Meters

Table D2: Active meters (Type B Calibrations)

Maximum overall uncertainty of Calibration equipment	Class of Meter under test			
	0.2	0.5	1	2
Measurements at unity power factor	+/- 0.2%	+/- 0.2%	+/- 0.6%	+/- 0.6%
Measurements at other than unity power factor	+/- 0.4%	+/- 0.4%	+/- 0.6%	+/- 0.6%

Table D3: Reactive Meters (Type A and C Calibrations)

Maximum overall uncertainty of Calibration equipment	Class of Meter under test	
	2.0	3.0
Measurements at zero power factor	+/- 0.5%	+/- 1.0 %
Measurements at other than zero power factor	+/- 1.0%	+/- 1.5%

Table D4: Reactive Meters (Type B Calibrations)

Maximum overall uncertainty of Calibration equipment	Class of Meter under test	
	2.0	3.0
Measurements at zero power factor	+/- 1.0%	+/- 1.5%

[11] Type C Calibrations may be carried out on site provided that the maximum overall uncertainty of the Calibration equipment meets the figures quoted in table D1 or D3 to a 95% confidence level in accordance with UKAS directive M3003, taking into account environmental conditions that include ambient temperature.

APPENDIX E. ANNUAL REPORT FORMAT

E1 Meter Calibration Report for Calendar Year_____
Meter Operator Agent_____

Meter Make and Model	Number of Meters Calibrated		Number of Meters found to be Outside of CoP4 limits[12]		Number of Meters Adjusted	
	Type B Cal	Type C Cal	Type B Cal	Type C Cal		

[12] For Meters that are found outside of CoP4 limits of error, please provide the errors obtained on a separate sheet.

[13] Comments shall include assumptions made during testing (e.g. tested import flow direction and Meter passed, export direction assumed to also pass as the same measuring element is used by the Meter in both directions of energy flow)

E2 Meter Sampling Report for Calendar Year_____ Meter Operator Agent_____

Meter Make and Model	No of Meters in Service	Number of Meters Calibrated		Number of Meters Outside CoP4 limits12		Number of Meters Adjusted
		Type B Cal	Type C Cal	Type B Cal	Type C Cal	