CODE OF PRACTICE FOUR

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

Issue 5

Version 4.1

DATE: 22 March 2007

Code of Practice Four

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

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	
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5	27/3/96	3.00	MDC Endorsed	CoP4 WG	
5	Code Effective Date[1]	3.00	Re-badging of Code of Practice Four for the implementation of the Balancing and Settlement Code.	BSCCo	Panel 16/11/00 (Paper 07/003)
5	BETTA Effective Date	4.0	BETTA 6.3 rebadging changes for the CVA Feb 05 Release	BSCCo	
5	22/3/07	4.1	Update following expert group review and BSCCo walkthrough (redlined)	BSCCo	

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

CONTENTS **Page number**

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.

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 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). It also states the requirements in relation to Codes of Practice 1, 2, 3, 5, 6, 7, 8 and 9 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.

Where Calibrations show that Meter accuracy is outside its defined limits, Meters should be Adjusted and re-Calibrated until CoP4 compliant accuracy is achieved 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.

It is expected, save in exceptional 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.

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.

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 may 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

This 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 662053-23: 2003: Static Meters for reactive energy (Classes 2 and 3)
- Meter Operation Code of Practice Agreement (MOCoPA), version 2.2, dated 9 August 2006.

4. DEFINITIONS AND INTERPRETATIONS

In this CoP4 unless the context requires otherwise any capitalised terms or expressions shall have the meaning given to them below. Where a capitalised terms or expression is used in this CoP4 and not defined below then it shall have the same meaning as is attributed to it in the Code. For the avoidance of doubt where a term or expression is defined in both this CoP4 and in the BSC and there is a conflict or ambiguity the definition in the BSC shall prevail.

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.

4.8 Commissioning

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

4.9 Compensation

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

4.10. 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.

4.11. Defined Metering Point

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

4.12. Electricity

Electricity - means Active Energy and/or Reactive Energy.

4.13. Meter

A device for measuring electrical energy.

4.14. 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.

4.15. Metering Equipment

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

4.16. Outstation

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

4.17. 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.

4.18. 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.

4.19. 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.

4.20. Standard(s)

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

4.21. 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 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.

4.22. 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 and testing of Metering Equipment.

4.23. 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 and testing 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 also covers Metering Equipment complying with Codes of Practice 1, 2, 3, 5, 6 and 7.

5.1 Meters – Calibration

This sections covers the different types of Calibration that may be carried out (and such criteria that is applicable with each type of Calibration) as well it containing provisions relating to sealing, the production of and maintenance of records associated with such 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. For CoP1 and CoP2 Metering Systems, Type A Calibrations shall be to IEC product standards;
- 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 as stated in Appendix D. For Calibrations carried out on site, where Calibrations show Meter accuracy is outside any of the above mentioned defined limits, Meters should be Adjusted/re-Calibrated/replaced until CoP4 compliant accuracy is achieved 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.

For Calibrations carried out in the laboratory/test house, where Calibrations show Meter accuracy is outside any of the above mentioned defined limits, Meters should be Adjusted/re-Calibrated/replaced until CoP4 compliant accuracy is achieved before the Meter is returned to service.

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

Following changes to Meter Compensations (including the application of Compensation to previously Blank Calibrated Meters), Meters should be re-

Calibrated (and Adjusted if necessary) to achieve the relevant Code of Practice compliant accuracy before return to service..

5.1.2 Meter Calibration Criteria

A Meter 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 practice 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 shall confirm what tests were undertaken at the test points 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 similar to those which apply to Type A Calibrations, the relevant uncertainties are dependent on 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 Practice1 and 2 Meters

For existing Meter Types 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 4.1 of CoP4, the following Calibration frequency and sample size requirements shall apply:

- For a 10 year period from the effective date of Issue 5, Version 4.1 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;

The frequency requirements mentioned above replace the Type B and C Calibration periods as stated in Appendix A. Please note that after ten (10) years from the effective date of Issue 5, Version 4.1 of CoP4, all Meters shall comply with the requirements of Appendix A.

For the avoidance of doubt any Code of Practice 1 or 2 Meter installed in the five years preceding the effective date of Issue 5, Version 4.1 of CoP4 must comply with the Calibration requirements in Appendix A.

5.1.3 Sealing

Meters should be sealed immediately after Calibration and prior to leaving the test facility. Sealing 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

Throughout this CoP4, 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.

The Calibration Certificates shall amongst other things 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.

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. The Calibration Certificates shall also provide a means to identify what equipment was

used to carry out the Calibrations and the person (or persons) responsible for the Calibrations.

Manufacturers' certificates, and the certificates providing results of additional Calibrations, shall include statements of the measurement uncertainties covering all measurement points.

The Calibration Certificates 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 Code of Practices 3, 5, 6 and 7 only the latest set of Calibration Certificates evidencing Calibration Types A, B & C must be retained (please note that this is a minimum requirement). Additionally, if a Type B Calibration has been performed after a Type C Calibration both the Type B and Type C Calibration Certificates should be retained. For the avoidance of doubt, if a Type C Calibration is performed after a Type B, then the Type B Calibration Certificate does not need to be retained.

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

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 also be obliged to provide an annual report to BSCCo with such annual report detailing the numbers of Meters Calibrated for each Meter Type and age since a particular type of Calibration was performed, together with the number of Meters that were found to be outside of prescribed limits (and their measured accuracies). A suggested format for this report is shown in Appendix E. Please note 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.

It is expected that actual Meter errors over a group of Meters will exhibit a pattern approaching a "normal distribution". It is noted that if an error pattern over a group of Meters shows a consistent bias towards the extremes of the error band additional evidence may be required from the MOA to justify such errors to BSCCo.

5.1.4.3 Inspection of certificates, records and testing

Each MOA shall ensure that the relevant Accredited Laboratory or test house that it has used will make available for review and confirmation, at the request of BSCCo, all test reports, records and certificates or otherwise which are required by this CoP4.

The results of all Calibrations and sampling tests performed on Meters shall be retained as Traceable records. .

5.1.4.4 Technical Audit

The MOA shall ensure co-operation by relevant Accredited Laboratories or test houses or by its representative on-site, and shall itself co-operate with BSCCo during a technical audit. Such technical audit may include but are not necessarily limited to witnessing, verification and repeat tests on any Meters or Standards Calibrated under this CoP4.

5.1.4.5 Quality Assurance

The Registrant shall ensure that a quality assurance system, preferably in accordance with BS EN ISO 9001, shall be in place by an Accredited Laboratory or test house which covers the activities and equipment used for Calibration in the Accredited Laboratory or test house and for sample Calibrations.

BSCCo shall have the right to establish confidence in any quality assurance system which is not in accordance with BS EN ISO 9001 and 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

In addition to the periodic Calibration requirements stated in Section 5.1, MOAs are required to perform sample Calibration in the following instances:

(a) Sample Calibration will apply to all newly installed Meter Types; and

(b) Sample Calibration will also apply to all installed Meter Types that have been approved Code of Practice compliant in the 5 years preceding the effective date of Issue 5, Version 4.1 of CoP4.

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

The Meter Operator Agent shall sample at least 1% of each new Meter Type per Code of Practice per annum, starting from year 8 after the Meter has undertaken a Type A Calibration.

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). A suggested format for this annual report is contained in Appendix E.

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

For Example, a MOA has 1500 installed Meters of a new Meter Types compliant with CoP5 and under the requirements of Section 5.1 it must perform a periodic Calibration on all Meters by year 15. If the MOA evenly phases its Type B Calibrations so as to achieve 100% by year 15, it would carry out 100 each year (6.7% each year). Therefore, the MOA will have Calibrated more than the 1% required by the sample Calibration obligations above and will have met these obligations through its approach to the periodic Calibration process.

5.3 Measurement Transformers

This section covers the requirements for initial Calibration, periodic Calibration and sample Calibration for measurement transformers. In addition it also contains provisions relating to the production and maintaining of records associated with the above activities.

5.3.1 Initial Calibration

New 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 for all ratios.

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.

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 is 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 complete with statements of measurement uncertainties covering all test points.

It is noted however that for existing measurement transformers (installed prior to the effective date of Issue 5, Version 4.1 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 (installed prior to the effective date of Issue 5, Version 4.1 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 every 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 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.

5.5 Commissioning

This section covers the requirements for Commissioning, sealing and the production of and maintenance of records relating to 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 must 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.

5.5.1 Commissioning Tests

Commissioning tests on site shall be performed to confirm and record amongst other things 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;
- 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.

Appendix F details example methods to achieve the above requirements and is for the guidance of the Commissioning engineer.

5.5.2 Sealing

At the completion of Commissioning, Metering Equipment shall be sealed in accordance with the requirements of any relevant BSC Procedure.

5.5.3 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 should be evidenced and reported to BSCCo.

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.

An example form of Commissioning evidence is shown in the MOCOPA, Appendix 2, Section A2.3.

The requirements for inspection of certificates, technical audit and quality assurance as detailed in sections 5.1.4.3-5.1.4.5 shall equally apply to Commissioning.

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 any relevant BSC Procedure.

6 Non Half Hourly Metering Systems

This section has been intentionally left blank. However, requirements are intended to be added in future, examples of which are in-service testing and commissioning.

7 Calibration Equipment for Meters

This section covers the requirements for the Calibration of equipment that is used when calibrating Meters. In addition it also refers to the production and maintenance of records associated with the Calibration of equipment used for calibrating 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. Alternatively, maximum tolerances of ±2° C shall apply.

7.1.1.2 Reference Standard Current transformers and Voltage transformers need not be maintained at a Reference Temperature in accordance with 7.1.1.1 where it is impracticable.

7.1.2 Calibration intervals

7.1.2.1 Reference Standard(s), other than Reference Standard current transformers and voltage transformers, 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.

7.1.2.2 Reference Standard current transformers and voltage transformers shall be Calibrated by an Accredited Laboratory at intervals not exceeding 5 years. Parties will apply to BSCCo, with supporting evidence, for the extension of the interval period.

7.2. Transfer Standards

7.2.1 Temperature tolerance

7.2.1.1 Reference Standards shall be maintained at the appropriate Reference Temperature. The effect of temperature variations shall be allowed for in the uncertainty budgets. Alternatively, maximum tolerances of ±2° C shall apply.

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, 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.

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 Parties may apply to BSCCo, with supporting evidence, such that the interval between such Calibrations may be increased to a maximum of 6 months.

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 equipment[2] must be produced using verifiable Standards and Calibration equipment used must operate according to these Standards.

7.4.2 A Traceable record of each Calibration of Standards employed in relation to Metering Equipment under this CoP4 shall be maintained by the MOA.

7.4.3 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 but any other suitable method may be used as agreed with BSCCo.

8 Calibration Equipment for Measurement Transformers

This section covers the requirements for Calibration of Measurement Transformers and it also contains provisions relating to the production of and maintenance of records relating to the same.

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 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. Directly comply with all the requirements detailed in Section 7.1-7.3 and permit themselves to be audited by BSCCo.

8.1 Records

8.1.1 All certificates for new Metering Equipment[3] must be produced using verifiable Standards and Calibration equipment used must operate according to these Standards.

[2] Brought into use after Issue 5, Version 4.1 of CoP4 is effective.

[3] First registered after Issue 5, Version 4.1 of CoP4 is effective.

8.1.2 The purchaser of the Metering Equipment shall use reasonable endeavours to ensure that the Calibration equipment used by the manufacturer satisfies the accuracy Standards set out in CoP4.

8.1.3 A Traceable record of each Calibration Standards employed in relation to Calibration Equipment under this CoP4 shall be maintained by the test house.

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

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.

ACTIVE METER

By Year	0	5	10	15	20	25	30	35	40
CoP1 & CoP2	A	Either: no test → or B and →	C		C		C		C
			B	[4]Cm + Bc OR Cc + Bm	B	B	[4]Cc + Bm OR Cm + Bc	B	B
CoP3, 5, 6 & 7	A			B	C	B	B	B	C

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

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

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

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.

[4] If a Type C Calibration is carried out on the Active main Meter (Cm) then a Type B Calibration should be carried out on the associated Active check Meter (Bc) or vice-versa. For example, if by year 15 the calibrations are Cm + Bc then by year 30 the calibrations should be Cc + Bm.

APPENDIX B. TEST POINTS

Meter Calibrations should be performed at the test points (load 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 load 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 load current closest to the test point value.

For example, a test point of 1% I_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, $0.02\ I_n \leq I < 0.05\ I_n$).

B1. Type A Calibration Test Points

Table B1. Type A Meter Calibrations for Codes of Practice 1, 2 and 3

Test Point	Active Meter			Reactive Meter		
Load current (% I_n)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
1	C					
2		C	C			
5	C, S			C, S		
10		C	C		C	C
100	C, S	C	C	C, S	C	C
120 or 150 or 200**	C	C	C	C	C	C

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

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

Test Point	Active Meter			Reactive Meter		
Load current (% I_n)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
1	S					
20	S	S			S	
100	S	S				

Notes:
Bi-directional Meters shall have the tests performed for both Import and Export
S = each element on its own
*Tests at 0.5 capacitive Power Factor are acceptable

B2. Type B Calibration Test Points

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

Test Point	Active Meter			Reactive Meter		
Load current (%I_n)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
5	C			C		
10		C	C		C	C
100	C	C	C	C	C	C
120 or 150 or 200**	C	C	C	C	C	C

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

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 > 10% and Power Factor > ± 0.8; or

2. Calibrate using an injection test when the load current < 10% and/or Power Factor < ± 0.8. The injection test shall use a current of > 10% and Power Factor > ± 0.8.

B3. Type C Calibration Test Points

Table B4. Type C Meter Calibrations for Codes of Practices 1, 2, 3, 5, 6 and 7

Test Point	Active Meter			Reactive Meter		
Load current (% I_n)	System Power Factor			System Power Factor		
	Unity	0.5 inductive	0.8 Capacitive*	Zero	0.866 Inductive	0.866 Capacitive
1	C					
2		C	C			
5	C, S			C, S		
10		C	C		C	C
100	C, S	C	C	C, S	C	C
120 or 150 or 200**	C	C	C	C		

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

APPENDIX C. MEASURED ERRORS

The following tables state the percentage error limits for each Class of Meter. Please refer to the relevant Code of Practice for the minimum Meter Class accuracy requirements.

Please note that I_b refers to basic current, I_n to the rated current of the Meter and I_{max} to the maximum current rating of the Meter.

Accuracy Tables for Active Meters

Table C1. Summary of Class accuracy requirements for Class 0.5, Class 1 and Class 2

Value of current (I)		Power factor	Percentage error limits for Meters of Class		
For direct connected 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 0.8 capacitive	+/- 1.3 +/- 1.3	+/- 1.5 +/- 1.5	+/- 2.5 -
$0.2\ I_b \le I \le I_{max}$	$0.1\ I_n \le I \le I_{max}$	0.5 inductive 0.8 capacitive	+/- 0.8 +/- 0.8	+/- 1.0 +/- 1.0	+/- 2.0 -

Table C2. Summary of Class accuracy requirements for Class 0.2S and Class 0.5S

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

Accuracy Tables for Reactive Meters

Table C3. Summary of Class accuracy requirements for Class 2 and Class 3

Value of current (I)		Power factor	Percentage error limits for Meters of Class	
For direct connected Meters	For transformer operated Meters		2	3
$0.05\ I_b \le I < 0.1\ I_b$	$0.02\ I_n \le I < 0.05\ I_n$	0	+/- 2.5	+/- 4.0
$0.1\ I_b \le I \le I_{max}$	$0.05\ I_n \le I \le I_{max}$	0	+/- 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

APPENDIX D. MEASUREMENT UNCERTAINTY

Table D1: Laboratory conditions, active Meters (Type A and C Calibrations)

Maximum overall uncertainty of test 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 5% of current

[2] +/- 0.2% for measurements at load points below 5% of current for Class 0.5S meters

Table D2: Site tests, active meters (Type B and C Calibrations)

Maximum overall uncertainty of test 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	+/- 0.2%	+/- 0.2%	+/- 0.6%	+/- 0.6%

Table D3: Laboratory conditions, reactive meters (Type A and C Calibrations)

Maximum overall uncertainty of test 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%	+/- 2.0%

Table D4: Site tests, reactive meters (Type B and C Calibrations)

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

APPENDIX E. RECORDS FORMAT

E1 Annual Calibration Report

Part A

Meter Type	No. of meters calibrated	Average age (max. and min.) since Type A calibration	Comment

Part B

Meter Type	No. of meters calibrated outside prescribed limits	Average age (max. and min.) since Type A calibration	Average measured accuracy (max. and min.)	Reasons for outside limits

E2 Annual Sample Calibration Report

Part A

Meter Type	No. of meters sampled	Average age (max. and min.) since Type A calibration	Comment

Part B

Meter Type	No. of meters sampled outside prescribed limits	Average age (max. and min.) since Type A calibration	Average measured accuracy (max. and min.)	Reasons for outside limits

APPENDIX F. GUIDANCE NOTES FOR HALF HOURLY COMMISSIONING

F1 Introduction

Commissioning is the process of demonstrating that the Metering Equipment complies with the relevant Code of Practice by a series of site tests and checks. Any failures identified by the site tests and checks to meet the relevant Code of Practice shall be rectified prior to completion of the Commissioning tests. Calibration of the individual components of the Metering System will have been performed prior to the Commissioning tests.

This Appendix sets out those tests and checks, which may be included in the Commissioning procedure for new installations and is for guidance purposes only. Where modifications or additions have been carried out to the Metering System only those tests and checks required to confirm the Overall Accuracy of the Metering System need be performed.

The scope of checks and tests listed below in Section F1.1 are the minimum requirements. It is the responsibility of the Commissioning engineers to produce detailed procedures, which shall include these requirements. Test equipment details and serial numbers along with the results of the checks and tests shall be recorded on these procedures and retained for future reference/audit.

Metering Equipment may in addition have basic tests on earthing, insulation, continuity and other tests, which would normally be conducted in accordance with Good Industry Practice.

Safe working methods are the responsibility of the Commissioning organisation.

Once the commissioning tests commence all Metering Equipment shall be secured to prevent anyone other than an authorised operative of the appointed Meter Operator Agent accessing the equipment.

F1.1 Scope of the Commissioning Tests

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

- The current transformers are of the correct ratio, phase and polarity and the current transformers are correctly located to record the required power flow;
- The voltage transformers are the correct ratio and phase and are correctly located to record the required power flow;
- The burdens on the measurement transformers are within the correct limits;
- The Meters are set to the same current transformer and voltage transformer ratios as the installed measurement transformers;
- 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;
- Phase rotation is standard at the Meter;
- The operation of the test terminal block; and
- Metering Equipment detects phase failure and operates the required alarms.

The following sections detail normal practice to achieve the above minimum requirements and are for the guidance of the commissioning engineer.

F1.2 Commissioning Tests

This section describes the Commissioning tests for both CVA and SVA registered Meters. For CVA registered Meters tests in F1.2.1 to F1.2.5 must be performed prior to energisation, whereas for SVA registered Meters these tests can be performed either with the system energised or de-energised.

For CVA registered Meters, on completion of the tests in F1.2.1 to F1.2.5, sufficient evidence should be recorded to confirm the Overall Accuracy of the Metering System is within limits of the relevant Code of Practice.

F1.2.1 Inspection/Tests

Check that the Metering System is complete and that no modifications will be carried out after the commission tests have been performed.

Record nameplate details from the measurement transformers, Meters, Outstations (where separate from the Meter) and metering protection equipment.

Check that measurement transformers and Meters have Calibration certificates for the correct Class and serial numbers and include Compensation for the Meters where appropriate.

Check any auxiliary supplies to the Metering Equipment are available and are the correct voltage.

Confirm the correct operation of the local interrogation facility (Meter or Outstation).

Check that the external communications to the Meter/Outstation are functioning and are in accordance with the Meter Technical Details (MTDs).

F1.2.2 Installation Data

Check all standing data including passwords has been programmed into the Meter and Outstation and the Meter/Outstation clock is set to UTC (GMT) within +/- 5 seconds.

Check the channel allocation against the MTDs.

Check the settings to any metering protection equipment, or ensure discrimination between protection equipment. Lowest rating nearest the Meter/Metering Equipment.

F1.2.3 Proving Transformer Ratios

Where practicable the following tests shall be performed. These tests may not be possible where the primary plant is not accessible or where tests would be meaningless, for instance on a High voltage measurement transformer.

Where these tests are not performed, the reason should be recorded and live commissioning tests used to confirm ratio, phasing and polarity.

Current Transformers

Inject each primary current transformer in turn and check that secondary current is passing through the Meter and the test blocks. Record the primary and secondary currents. Check current transformer ratio against Meter Technical Details

Carry out flick tests to establish polarity.

Voltage Transformers

For polyphase Voltage transformers, inject two or three phase voltages onto the primary of the voltage transformer (400V or 230V is usually adequate). Record primary and secondary voltages and phase rotation at the Meter and the test blocks. Where voltage transformer neutral connections are available inject single phase from each primary phase to neutral and record the secondary phase to neutral voltages. Calculate, record and check the voltage transformer ratio against the Meter Technical Details.

F1.2.4 Burden Tests

Carry out a burden test and prove the measurement transformers will not be over burdened even at full load.

The following tests are examples of performing a burden test and there are other ways to check burden ratings.

Inject current as close as is practicable to the measurement transformers to establish and record the burden on the Current transformers and Voltage transformers. Where primary injection has not been performed check that current and voltage is present at the Meter and the test blocks. Check that the burden ratings are within the normal operating range of the measurement transformers. Where burden values have been used to compensate the Meter, check that any estimated values are accurate. Record the value of burdens (including any non settlement burdens) necessary to provide evidence of the overall metering accuracy.

Resistance measurements may also be used to check the burden rating.

F1.2.5 Secondary Injection Tests

Inject current and voltage from the test blocks into the Meter at the rated values. Check that the injected energy matches all the outputs of the Meter, which may include test Light Emitting Diodes (LEDs), dials, pulse outputs and serial data. Where separate Outstations are installed, check that energy injected is correctly recorded by the Outstation. Sufficient energy should be injected to provide meaningful results. Normally this would be done over a complete half-hour period. All the values will be recorded at the start and finish of the test and compared against the expected results (to include Compensation where appropriate). This test shall be repeated to cover all measurement quantities of the Meter i.e. Import, Export, Active and Reactive Energy. This test may be used in conjunction with the proving tests.

F1.2.6 Phase Failure Detection Tests

Carry out a test to confirm that the phase fail detection equipment works.

For example, for CVA inject any installed metering protection equipment e.g. voltage transformer phase failure or phase unbalance. Check for correct settings and monitor the local and remote alarms.

For SVA, carry out tests to confirm the correct operation of Meter voltage failure indicators.

F1.2.7 Records

Record all Meter and Outstation dial readings on completion of tests F1.2.1-F1.2.6.

F1.2.8 Commissioning Tests with the System Live

These tests shall be performed when the system is first energised. However, for SVA this may be delayed until the site gains enough load to carry out a significant test usually at least 10% of full load.

Check that the Meter is energised and recording energy in the correct quadrant.

For CVA

Carry out a prevailing load check by measuring the energy at the test terminals against the recorded energy at the Meter. Confirm that the main and check Meters are recording identical values of energy.

Phase out the metering voltage transformer secondary connections against another known voltage transformer connected to the same source. Confirm the ratio of the voltage transformer by comparison.

Measure the metering current transformer secondary current and compare with the secondary current from an independent current transformer, which has its primary connected in series with the metering current transformer. A current clamp Meter is sufficient for this test. This is intended to confirm that the correct current transformer tap has been selected and it is expected that the comparison values should be within 10%.

Where a separate measurement of energy is available (this could be a test energy Meter or even a power indicator for a steady load) which is independent of the metering Current transformers & Voltage transformers on the circuit, then a comparison over a half-hour period could be performed and recorded. This is not an accuracy check and is intended to confirm the overall system is of the right order. It is expected that the comparison values should be within 10%.

For SVA

Carry out a prevailing load check by measuring the primary[5], secondary and Meter energy values and compare against each other. These values should be within 10% of each other.

For both CVA and SVA

Carry out a phase rotation test at the test terminal block and the Meter. The Meter must be standard phase rotation.

Where possible confirm that the Meter is recording similar current and voltage values to primary or secondary load.

Carry out a test to confirm the operation of the test terminal block

F2 Records

On the completion of all tests sufficient information should be recorded to confirm the Overall Accuracy of the Metering System is within the limits of the relevant Code of Practice. See Section 5.5.4 of Code of Practice 4 for the minimum evidence to be contained within the records.

[5] Primary source should be direct where possible using a current clamp ammeter and volt meter. Could be using a independent current transformer which has its primary connection in series with the metering current transformer or independent energy Meters, voltage and current Meters.