Balancing and Settlement Code

Code of Practice Four

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

Issue 6

Version 19.0

Date: 22 September 2025

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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 definition of "Code of Practice" in Annex X-1 thereof.

2. This is Code of Practice Four, Issue 6, Version 19.0.

3. 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.

4. This Code of Practice is effective from 22 September 2025.

5. This Code of Practice has been approved by BSCCo~~the Panel~~.

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AMENDMENT RECORD

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

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Issue	Date	Version	Description of Changes	Changes Included	Approval Reference(s)~~Mods/ Panel/ Committee Refs~~
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FOREWORD

This Code of Practice Four (CoP4) relates to the requirements for the Calibration, sample Calibration, 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~~BSCCo (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 (save for Meters used with CoP10 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 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 all Non Half Hourly Metering Systems and Meters used with CoP10 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 (including Meters used with CoP10 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.

For the purposes of this Code of Practice 4 and for the avoidance of doubt, all Meters that are being, or are to be used with CoP10 Metering Systems shall be calibrated in accordance with Section 6 'Non Half Hourly Metering Systems'.

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 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 the obligations and requirements on the Meter Operator Agent[2] (MOA) responsible for the Metering System or, in the case of measurement transformers and test facilities under the

[2] SVA MOAs will carry out obligations in this CoP4 in accordance with the Retail Energy Code

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ownership of a BSC Party, the responsibilities of that Party, for example the relevant network operator (transmission or distribution as appropriate). In respect of some of the requirements the obligations and requirements are described as being against a third party. It is noted however that under the BSC the ultimate responsibility for compliance with this CoP4 and the overall performance of the Metering System as a whole is that of the Registrant.

This CoP4 derives force from the BSC and 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 that 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).

It shall be the responsibility of the Registrant to ensure that all Metering Equipment is appropriately Commissioned and records maintained for each item of Metering Equipment for the life of that Metering Equipment in accordance with this CoP4.

In the case of current transformer operated Metering Equipment it shall be the responsibility of the MOA to notify its Registrant, via an auditable, electronic method, that either:

- All items of Metering Equipment have been fully and successfully Commissioned in accordance with this CoP4; or that

- There are defects or omissions in the completion of the processes set out in this CoP4 which have the potential to affect Settlement. Such notification shall include details of any defects or omissions identified and an assessment of the potential implications for the Registrant, customer and network operator. Where such notification is provided and the Registrant believes that there is a risk to Settlement it shall, in accordance with Section L3.6 of the BSC, consult with the relevant network operator and agree the appropriate steps to be taken to minimise the risks to Settlement. Such agreements shall be recorded and be made available on request to ~~the BSC Panel~~BSCCo.

2. APPLICATION TO OTHER CODES OF PRACTICE

CoP4 specifies the accuracy requirements for Meters including those in which Compensations have been applied in accordance with the relevant Code of Practice. 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.

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3. REFERENCES

The following documents should also be referred to when considering this CoP4[3]:-

- 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: Quality management systems – Requirements
- BS EN ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
- BS EN/IEC 61869-2: Instrument Transformers – Part 1 Current transformers
- BS EN/IEC 61869-3: Instrument Transformers – Part 2 Inductive voltage transformers
- BS EN/IEC 61869-4: Instrument Transformers – Part 3 Instrument transformers. Combined transformers
- BS EN/IEC 62053-11: Electromechanical Meters for active energy (Classes 0.5, 1 and 2)
- BS EN/IEC 62053-21: Static Meters for active energy (Classes 1 and 2)
- BS EN/IEC 62053-22: Static Meters for active energy (Classes 0.2S and 0.5S)
- BS EN/IEC 62053-23: Static Meters for reactive energy (Classes 2 and 3)
- Statutory Instruments 1998 No.1566 The Meters (Certification) Regulations 1998
- Statutory Instruments 2016 No.1153. Weights and Measures. The Measuring Instruments Regulations 2016

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.

Note: * indicates definitions in the Code.

Note: † indicates definitions which supplement or complement those in the Code.

[3] Metering Equipment should be tested and stamped to the latest iteration of the applicable standard named in this document at the time of initial registration.

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Note: ‡ indicates definitions specific to this Code of Practice

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 Boundary Point *

Boundary Point means a point at which any Plant or Apparatus not forming part of the Total System is connected to the Total System.

4.6 Calibration ‡

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

4.7 Commissioning ‡

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

4.8 Commissioning End to End Check ‡

A Commissioning End to End Check (CEEC) is a data comparison check, performed by the Registrant of a Central Volume Allocation (CVA) Metering System, in conjunction with the Central Data Collection Agent (CDCA), where the Registrant confirms that a CVA Metering System is recording energy with the same order of magnitude, and in the correct direction, to that expected and that recorded by the CDCA instation

4.9 Compensation ‡

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

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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 Equipment Owner *

Means, in relation to a Metering System, a person which is the owner of Metering Equipment comprised in that Metering System but is not the Registrant of that Metering System.

4.14 Independent Connection Provider †

Means the definition given in the Competition in Connections Code of Practice.

4.15 Meter *

A device for measuring Active Energy or Reactive Energy.

4.16 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.

4.17 Metering Equipment *

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

4.18 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, Data Collector or Data Service Agent, 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.

4.19 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

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Overall Accuracy criterion for a Metering System is as stated in the relevant Code of Practice.

4.20 Reference Conditions ‡

Reference Conditions mean the appropriate set of influence quantities and performance characteristics, with reference values, their tolerances and reference ranges, with respect to which the intrinsic error of a Meter is specified.

4.21 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.

4.22 Reference Temperature ‡

Reference Temperature means the temperature at which that apparatus has been calibrated. If no temperature is stated the Reference Temperature is 23°C.

4.23 Single Line Diagram (SLD) ‡

SLD means simplified notation for representing a three-phase power system that must show the location of all relevant circuits and the Metering Equipment associated with a site.

4.24 Standard(s)

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

4.25 Systems Connection Point *

Systems Connection Point means a point of connection (whether consisting of one or more circuits) between two or more Systems excluding:

a) a point of connection between Distribution Systems in the same GSP Group; and

b) a point of connection between Offshore Transmission System User Assets and the Transmission System;

4.26 Testing Facilities

Means the facilities provided close to the Meter which enable such Meters to be routinely tested as set out in the relevant CoP (this is sometimes referred to as the test terminal block/s).

4.27 Test House ‡

Means a test facility that is not an Accredited Laboratory.

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4.28 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;

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

d) In relation to Calibrations and measurements, that all such Calibrations and measurements are derived from national measurement standards, either directly or indirectly.

4.29 Transfer Standard ‡

Transfer Standard means a 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.

4.30 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 CALIBRATION,COMMISSIONING AND RECORD KEEPING FOR METERING EQUIPMENT [4]

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 (CoPs 1,2,3,5,6 and 7)

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

[4] Save for those arrangements where the (only) metering used for Settlement purposes is CoP 10.

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- 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 Calibration equipment 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[5]

Phase-advanced Reactive hour (PARh) Meters shall be calibrated in accordance with the relevant appendices as a Class 2 reactive Meter.

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 (save where a Type A Calibration was carried out on a Compensated Meter[6]) 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.

5.1.2 Meter Calibration Criteria

Meters ordered after the effective date of CoP4 Issue 6, Version 5.0 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 Calibration equipment so that the measurement uncertainty of such Calibration equipment 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 with tests at the load points specified in Tables B1 and B2 of Appendix B.

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/IEC 62053-22 (Active static Meters of Classes 0.2S and 0.5S), 62053-11 (Active electromechanical Meters of Classes 0.5, 1 and 2), 62053-21 (Active static Meters of Classes 1 and 2), 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.

[5] 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 100.
[6] A Type A Calibration Certificate provided for a Compensated Meter shall only be applicable to that Meter with those Compensation values applied.

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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 and shall be at the load points specified in Appendix B, Section 2.

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 Transitional Arrangements for Periodic Calibrations for Existing 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 6, Version 5.0 of CoP4, the following requirement replaces the need for both sample and periodic Calibrations (as defined in previous issues of CoP4):

(i) During the 10 year period from the effective date of Issue 6, Version 5.0 of CoP4, at least 2% per annum of the total of each such Meter Type 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[5].

(ii) By the end of the 10 year period, all existing Meters shall have been Type B or Type C calibrated.

Once existing Meters have been subject to a Type B or Type C Calibration in accordance with 5.1.2.4(i) or 5.1.2.4(ii), they will then be subject to re-Calibrations in accordance

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with Appendix A, except that the Type C Calibration undertaken in 5.1.2.4(i) or 5.1.2.4(ii) replaces the initial Type A Calibration and "year zero" in Appendix A is the year of the Type C Calibration. Where the first Calibration undertaken in the transition period is a Type B Calibration, then this is to be treated as the first Type B Calibration of Appendix B.

For the avoidance of doubt any Code of Practice 1 or 2 Meters installed in the five years preceding the effective date of Issue 6, Version 5.0 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 (as defined in previous issues of CoP4 which are 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 (as defined in previous issues of CoP4 which are equivalent to a Type B Calibration) a Type C Calibration shall be performed within 5 years of the CoP4 test.

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 tamper evident seal provided and fitted by the test facility or will be in accordance with BSCP06 'CVA Meter Operations for Metering Systems Registered in CMRS', or the Retail Energy Code Meter Operation Code of Practice Agreement 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 Meters 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 Meters ordered after the effective date of Issue 6, Version 5.0 of CoP4 the results shall include a measurement uncertainty evaluation 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 Meter Types calibrated, the name of the testing body, the location of the Calibrations, the date on which the Calibrations were concluded and where appropriate, the measurement uncertainties.

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For Type A Calibration Certificates pre-dating Issue 6, Version 5.0 of CoP4 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.

For Meters ordered prior to the effective date of Issue 6, Version 5.0 of CoP4, manufacturers' Certificates need not include measurement uncertainties covering all measurement points, however all other Certificates (including manufacturers' Certificates) provided after the effective date shall include a statement/s of the measurement uncertainties covering all measurement points.

The Calibration Certificates that apply to Meters ordered after the effective date of Issue 6, Version 5.0 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 Type 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, 5, 6 & 7 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.

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

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.

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For Type B and Type C Calibrations, the MOA shall provide an annual Calibration report to BSCCo. The format of this report is given in Table E1 of 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 made available on the BSCCo website in summarised form ~~however a fully disclosed version of the annual report shall be made 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 Meter Certificates[7], records and procedures relating to this Code of Practice.

Save as in respect of Codes of Practice 3, 5, 6 & 7 as referred to in Section 5.1.4.1 'Calibration Certificates', the results of all Calibrations and sample Calibrations 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 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(CoPs 1,2,3,5,6 and 7)

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 calibrate at least 2% of the total number of each Meter Type (as identified by BSCCo) which they are responsible for, per annum; CoP1 & 2 Metering Systems starting from year 2 and CoP3, 5, 6 & 7 Metering Systems shall commence from year 8 after the Meter has undertaken a Type A Calibration. Where periodic calibrations exceed stated sample Calibration rates, separate sample Calibrations are not required. Where the total number of each Meter Type (under the responsibility of an individual MOA) is less than 100, then a minimum of 2 shall be sample calibrated per annum, starting from year 2 or year 8 as appropriate.

[7] Where Certificates are not available, refer to Section 5.1.4.1.

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The MOA shall provide an annual report to BSCCo on the sample calibrated Meters. This annual report shall contain information on the number of Meters sampled per Meter Type, and the number of Meters that were found to be outside of prescribed limits (and the measured accuracy of each of those found outside prescribed limits). The format for this annual report is contained in Table E2 of 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 sample Calibration report may be made available on the BSCCo website in summarised form ~~however a fully disclosed version shall be made available to the Panel~~.

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.

5.2A End of Life Sample Calibrations

As well as the periodic and sample Calibration requirements stated in Section 5.1 and 5.2, MOAs shall perform end of life sample Calibrations on CoP3 and CoP5 Metering Systems.
BSCCo shall identify annually the Meter Types to be sample calibrated.
The MOA shall end of life sample calibrate for each Meter Type in CoP3 and CoP5 Metering Systems which they are responsible for. The commencement date will be dependent on the certification period[8] of the Meter Type:

- For a certification period of 10 years in year 9 after the Meter has undertaken a Type A Calibration; or
- For a certification period of 15 years in year 14 after the Meter has undertaken a Type A Calibration.

An end of life sample Calibration will involve the undertaking of a Type C Calibration.
The number of samples required for each Meter Type, per annum, for a known population size, per MOA, is given in the following table:

Table 1: Sample size indexed population size

Population Size	Sample Size
100 to 500	5
501 to 2000	10
2001 to 10000	20
>10000	40

Where the total number of each Meter Type (under the responsibility of an individual MOA) is less than 100, then a minimum of 2 shall be sample calibrated, per annum, in year 9 or year 14, dependant on the certification period, after the Meter has undertaken a Type A Calibration.
Where periodic calibrations exceed stated end of life sample Calibration rates, separate end of life sample Calibrations are not required.
Calibration tests can be performed on a Meter Type on a Meter removed from site, so long as it was not removed due to a fault, where it was no longer required, but where no Meters are available, the Registrant will be required to remove the Meters from site to test or arrange to test them at site.

[8] Electricity Act 1989: Statutory register of all pattern approved electricity meters suitable for billing purposes in the UK - Schedule 4: UK nationally approved electricity meters

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The MOA shall provide to BSCCo:

- an annual report to BSCCo on the end of life sample calibrated Meters. This annual report shall contain information on the number of Meters sampled per Meter Type, and the number of Meters that were found to be outside of prescribed limits (and the measured accuracy of each of those found outside prescribed limits). The format for this annual report is contained in Table E3 of Appendix E; and
- a copy of the Type C Calibration test results.

It ~~BSCCo shall collate and report the findings to the Panel. It~~ should be noted that certain elements of information provided in this annual end of life sample Calibration report may be made available on the BSCCo website in summarised form ~~however a fully disclosed version shall be made available to the Panel~~.

Where Calibration test results show that actual Meter errors over a group of Meters do not exhibit a pattern approaching a "normal distribution" and it shows an error pattern over a group of Meters with a consistent bias towards the extremes ~~the Panel~~ BSCCo may, in consultation with the SAF, decide a particular type should no longer be installed and / or removed from service over a transitional period~~, the timescales for which will be determined by the Panel~~.

Evidence shall be retained and made available as and when required, so as to provide a satisfactory audit trail, showing that end of life sample Calibrations have been carried out in a timely manner.

5.3 Meters – Calibration (CoP10)

5.3.1 Initial Calibration

All CoP 10 Meters shall be calibrated in accordance with Schedule 7 of the Electricity Act 1989, prior to installation.

5.3.2 Periodic Calibration

There is no requirement for periodic Calibration of CoPs 10 Meters for Settlement purposes.

5.3.3 In-service accuracy testing (for Supplier billing purposes)

In respect of in-service testing for all CoP 10 Meters, approved under the National approvals process under the Electricity Act 1989, the requirements of the National Sample Survey apply.

In respect of in-service testing of CoP 10 Meters, under Statutory Instruments 2016 No.1153[8], the requirements of the In-Service Testing (IST) Handbook apply.

5.4 Measurement Transformers and Testing Facilities

5.4.1 Responsibility for Calibrations and maintenance of Records.

Where measurement transformers are owned by a BSC Party, or that BSC Party has agreed to adopt[9] the measurement transformers, that Party shall be responsible for ensuring the requirements of 5.3 are performed up to and including the Testing Facilities. In addition that Party shall prepare, and make available upon request,

[9] For example via an adoption agreement between a BSC Party and an Independent Connection Provider (ICP).

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complete and accurate calibration records in relation to these obligations. Since Metering Equipment comprised within a CVA Metering System(s) must be Commissioned prior to energisation (and so prior to adoption), where measurement transformers, which a BSC Party has agreed to adopt; and are, or are to be, comprised within a CVA Metering System(s), the Registrant shall be responsible for Commissioning of all Metering Equipment irrespective of the Equipment Owner.

Where measurement transformers are not owned by a BSC Party the Registrant, via its appointed MOA, shall be responsible for these requirements.

BSCCo (or any delegated 3rd party) shall have the right to audit any off site Commissioning agent performing Commissioning off site to ensure that the Commissioning is undertaken in line with CoP4 requirements. Any such audit will be facilitated by the BSC Party responsible for ensuring the requirements of Section 5.5 are performed on its Metering Equipment up to and including the Testing Facilities. Any non-compliance found shall be the responsibility of the relevant BSC Party responsible for the Commissioning.

5.4.2 Initial Calibration

Certificates produced for new measurement transformers[10] must be produced using verifiable Standards.

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/IEC 61869-2 and/or (as appropriate) BS EN/IEC 61869-3 and/or (as appropriate) BS EN/IEC 61869-4 accuracy and measurement range requirements, as appropriate for the measurement transformer's class index[11].

For Certificates produced for measurement transformers ordered after the effective date of Issue 6, Version 5.0 of CoP4, the accuracy test results shall include a measurement uncertainty evaluation 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/IEC 61869-2, BS EN/IEC 61869-3 and BS EN/IEC 61869-4).

5.4.3 Periodic Calibration

Periodic Calibration and sampling are not required for measurement transformers.

[10] Ordered after Issue 6, Version 5.0 of CoP4 is effective.

[11] Compliance to a different BS EN/IEC standard from the applicable standard named in this document is allowed where one of the conditions, set out in Section 5.1 of the relevant CoP, is met.

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5.4.4 Records

All records of Calibration for measurement transformers (as detailed above) shall be held in the form of Traceable Certificates and shall identify the date on which the Calibrations were concluded. Certificates produced for measurement transformers ordered after the effective date of Issue 6, Version 5.0 of CoP4 shall be complete with statements of measurement uncertainties covering all test points. This may be a single value covering the entire range of test points, a series of values covering discrete ranges or the actual test points.

It is noted however that for existing measurement transformers (ordered prior to the effective date of Issue 6, Version 5.0 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 on the BSC Website), then those stated errors shall be applicable., then those stated errors shall be applicable.

The requirements for inspection of Calibration Certificates, technical audit and quality assurance as detailed in Sections 5.1.4.3-5.1.4.4 shall equally apply to measurement transformers.

For existing measurement transformers (ordered prior to the effective date of Issue 6, Version 5.0 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.

5.5 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[11] for each voltage failure alarm check.

If a failure is identified it must be rectified and re-checked.

5.6 Commissioning

Where measurement transformers are owned by a BSC Party, or that BSC Party has agreed to adopt[9] the measurement transformers, that Party shall be responsible for ensuring the requirements of 5.5, are performed on its Metering Equipment up to and including the Testing Facilities. In addition that Party shall prepare, and make available upon request, complete and accurate commissioning records in relation to these obligations. Since Metering Equipment comprised within a CVA Metering System(s) must be Commissioned prior to energisation (and so prior to adoption), where measurement transformers, which a BSC Party has agreed to adopt; and are, or are to be, comprised within a CVA Metering System(s), the Registrant shall be responsible for Commissioning of all Metering Equipment irrespective of the Equipment Owner.

Where measurement transformers are not owned by a BSC Party the Registrant, via its appointed MOA, shall be responsible for the Commissioning of all Metering Equipment.

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For the avoidance of doubt, and notwithstanding the obligation under the BSC for the Registrant to ensure compliance, it shall be the responsibility of the relevant MOA to ensure that the Metering System complies with the requirements of the applicable CoPs including the assessment of overall accuracy based on any evidence provided by other Parties in accordance with CoP4.

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.

5.6.1 Instruments for Commissioning

The MOA[12] shall establish and maintain a process to periodically calibrate the instruments used for Commissioning (from which measurements are recorded). Each instrument shall be Traceable. The MOA[11] 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[11], depending on the type of instrument used and manufacturer's recommendations, but in any event not exceed 2 years. If an instrument is found to be outside of the required accuracy limits, the MOA[11] shall consider what impact that inaccuracy has had on previous commissioning tests, and if necessary revisit those Metering Systems, and keep a record of their determination.

5.6.2 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;
- 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 are set to the same current transformer and voltage transformer ratios as the installed measurement transformers;

[12] or relevant network operator, as appropriate. Where current transformers are Commissioned off site in line with paragraph 3 (Section 5.5.2) then the BSC Party responsible for the Commissioning of measurement transformers shall ensure a traceable process exists and is followed for the periodic calibration of instruments used for Commissioning.

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- 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;

- The Metering Equipment detects phase failure and operates the required alarms.

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

Current transformers[8] integrated in low voltage cut outs or switchgear may be partially Commissioned off site, provided there is no further alteration to the Metering Equipment following Commissioning and provided that this is done in accordance with Section 5.5.2 of CoP4 (other than the requirement that the Commissioning be performed on site). On site Commissioning tests will still be required on site by the MOA to ensure all of the obligations under Section 5.5.2 are met[9]. Tamper evident seals shall be used following off site Commissioning and these shall be replaced on site by seals as specified in Section 5.5.3 once Commissioning is complete. For the avoidance of doubt where the current transformers are owned by a BSC Party that Party shall be responsible for ensuring the requirements of Section 5.5.2, are performed on its Metering Equipment up to and including the Testing Facilities. Where the current transformers are not owned by a BSC Party then the Registrant of the Metering System, via its appointed MOA, shall be responsible for ensuring these requirements are met.

5.6.3 Sealing

At the completion of Commissioning, Metering Equipment shall be sealed in accordance with the requirements of BSCP06 or Retail Energy Code Meter Operation Code of Practice Agreement as appropriate.

5.6.4 Records

Where measurement transformers are owned by a BSC Party, or that BSC Party has agreed to adopt[99] the measurement transformers, that Party shall provide such evidence, as BSCCo may require, to confirm that, following its Commissioning, Metering Equipment (up to and including the Testing Facilities) shall meet the requirements of the Code and relevant Codes of Practice. Where measurement transformers are not owned by a BSC Party the Registrant, via its appointed MOA, shall be responsible for these requirements.

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.

[8] Where current transformers are of a multi-ratio design, then the responsible Commissioning party will be required to complete elements of Commissioning on-site (and post installation) to ensure the correct ratio has been selected.
[9] For the avoidance of doubt, where current transformers are Commissioned off site then the MOA will not be required to complete additional tests outside of the scope of Section 5.5.2 and 6.2 of CoP4. The MOA testing should not be altered by off site Commissioning of current transformers integrated in low voltage cut-outs or switchgear.

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If Metering Equipment is changed, then its Commissioning record should be retained by the relevant BSC Party or MOA as appropriate and provided to BSCCo if required.

All evidence must be Traceable and dated. The evidence provided shall contain, as a minimum and where applicable, the following information:

- Site name
- Site address
- Metering System Identifier (MSID/MPAN)
- - Relevant BSC Party or 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.
- Where Commissioning has taken place off site, records shall include the identity of the off site Commissioning agent along with the address at which the testing was performed. For the avoidance of doubt, where BSCCo intends to audit an off site Commissioning agent completing off site Commissioning, BSCCo will contact the Party responsible for ensuring the requirements of CoP4 Section 5.5 have been met. It is the responsibility of said Party to organise the site audit.

5.7 Proving

In order to ensure that the metered data recorded by the Metering System's Outstation(s) can be transferred to the Settlements instation, a Proving Test shall be performed in accordance with the Retail Energy Code Metering Operations Schedule or BSCP02 as appropriate. Metering Systems assigned to Measurement Class F are exempt from this requirement.

5.8 Commissioning End to End Check

In order to ensure that the metered data recorded by a CVA Metering System's Outstation(s), and transferred to the Settlement instation, is recording energy with the same order of magnitude, and in the correct direction, to that expected by the Registrant, a Commissioning End to End Check (CEEC) shall be performed for new, or additions to, a CVA Metering System. Additionally, where any CVA Metering System is worked on, that CVA Metering System may require a CEEC if the work meets the criteria specified in BSCP02.

The MOA appointed to a CVA Metering System shall identify, to the CDCA, whether a CEEC is required, in accordance with BSCP20. Where required, the CDCA shall submit a sample of metered data to the Registrant for the CEEC.

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5.8 Single Line Diagram

A Single Line Diagram shall be provided in accordance with the relevant CoP showing:

- the Boundary Point(s) and/or System Connection Point(s), including the location of each Defined Metering Point(s) where different;
- all relevant circuits that have Settlement Metering Equipment that is, or is to be, registered for Settlement purposes and the physical location of the Settlement Metering Equipment (i.e. Actual Metering Point(s)). This includes Metering Equipment located within a Licence Exempt Distribution Network (private network) in an High Voltage/Extra High Voltage connected site or any Complex Site, irrespective of its connection voltage;
- accuracy classes of all Settlement measurement transformers; and
- the available ratio(s) of all Settlement measurement transformers and, where multi-ratio, the ratio selected.

6 NON HALF HOURLY METERING SYSTEMS[13] AND COP10 HH METERING SYSTEMS

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 for 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.

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 multiphase installations the relationships between voltages and currents are correct and that phase rotation is standard at the Meter terminals;
- The burdens on any current transformers are within the correct limits;

[13] This section is provided to cover the requirements for Commissioning and in-service testing of all non-half hourly Metering Equipment, and HH Metering Equipment where the (only) metering used for Settlement purposes is CoP 10. 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 Statutory Instruments 2016 No.1153) Meters will be populated to this section once they are agreed.

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- The Meters are set to the same current transformer ratios as the installed current transformers;

- 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 then only those items are required to be Commissioned. For clarification, Metering Systems in their entirety need not be re-Commissioned when items are replaced within that system.

Current transformers integrated in low voltage cut outs or switchgear may be partially Commissioned off site, provided there is no further alteration to the Metering Equipment following Commissioning and provided that this is done in accordance with Section 6.2 of CoP4 (other than the requirement that the Commissioning be performed on site). On site Commissioning tests will still be required on site by the MOA to ensure all of the obligations under Section 6.2 are met[9]. Tamper evident seals shall be used following off site Commissioning and these shall be replaced on site by seals as specified in Section 5.5.3 once Commissioning is complete. For the avoidance of doubt where the current transformers are owned by a BSC Party that Party shall be responsible for ensuring the requirements of Section 6.2, are performed on its Metering Equipment up to and including the Testing Facilities. Where the current transformers are not owned by a BSC Party then the Registrant of the Metering System, via its appointed MOA, shall be responsible for ensuring these requirements are met.

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 accreditation 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 be audited by BSCCo; or

(iii) Directly comply with all the requirements detailed in Section 7 and be 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.

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7.1 Reference Standards

7.1.1 Temperature tolerance

7.1.1.1 Reference Standards shall be maintained at the appropriate Reference Temperature +/- 2° C. 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, 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.

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7.3 Working Standards

7.3.1 Temperature tolerance

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.

7.3.3 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 Calibration equipment used must be produced using verifiable Standards and shall identify the date on which the Calibrations were concluded.

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:

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(i) Have an accreditation for all Calibration equipment and procedures from a recognised accreditation 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 8.1-8.2 and be subject to audit as necessary.

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

8.1 Reference Standards

8.1.1 Temperature tolerance

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.

8.1.2 Calibration intervals

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 Records

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

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.

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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 programme of Calibrations.

ACTIVE METER

By Year	0	5	10	15	20	25	30	35	40
CoP1 & CoP2	A	-	C	-	C	-	C	-	C
		Bm[14]	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.

REACTIVE METER

For reactive CoP1 and CoP2 Meters, the intervals between Calibrations are twice those for active Meters. In the case of CoP2 main reactive Meters and where the Calibration Types and periods used are as highlighted in row 2, then these Meters shall be Type B calibrated at 10 year intervals.

For reactive CoP3 and CoP5 Meters, the intervals between Calibrations are the same as those for active CoP3 and CoP5 Meters (except for Type B Calibrations – see Appendix B, Section 2).

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.

[14] 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).

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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, for a CoP2 Class 0.5 active Meter, Tables B1 and B4 require it to be tested with a value of current of $0.01I_n$ at unity power factor. However, for this value of current and power factor there is no corresponding percentage error limit in Table C2. In this case the value of current (at unity power factor) nearest to $0.01I_n$, for a transformer operated Meter, is the range $0.02I_n \leq I < 0.05I_n$. Therefore, the appropriate percentage error limit will be +/- 1.0 %.

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

1. Type A Calibration Test Points

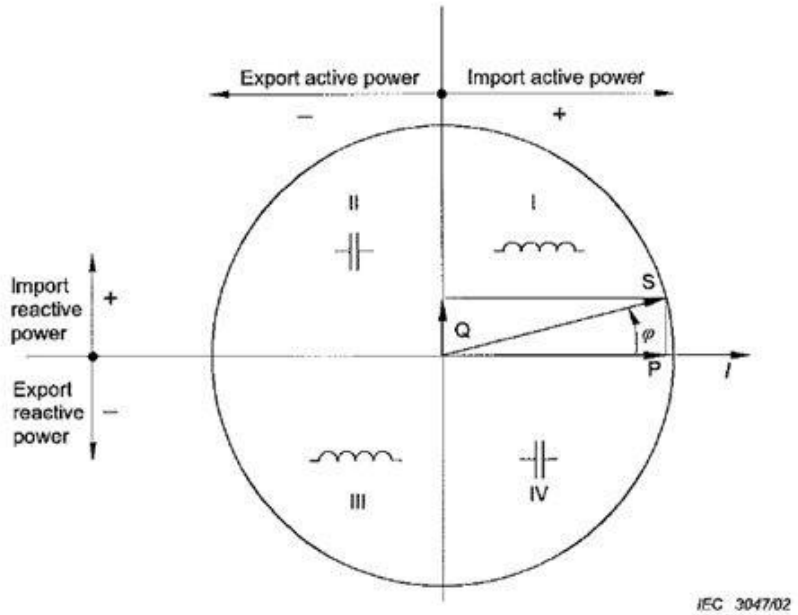
Table B1: Type A Meter Calibrations for Codes of Practice 1 and 2

Test Point	Active Meter			Reactive Meter		
Value of current (I)	Cos φ			Sin φ		
	Unity	0.5 Inductive	0.8 Capacitive*	1	0.5 Inductive	0.5 Capacitive
0.01 I_n	X					
0.02 I_n		X	X			
0.05 I_n	X (3), Y			X, Y		
0.1 I_n		X	X		X	X
1.0 I_n	X (2), Y (5)	X (4)	X	X, Y	X	X
1.0 I_{max} or 1.2 I_n or 1.5 I_n or 2.0 I_n**	X (1)	X	X	X	X	X

Notes:
These tests shall be carried out for Import/Export directions, as registered in SMRS or CMRS for a given Metering Point. If the same measuring element is used for both Import and Export one additional test point only (at 1.0 I_n, Unity Power Factor, balanced) is required in the reverse direction.
X= all elements combined.
Y = each element on its own.
X,Y means tests should be carried out on all elements combined and each element on its own.
*Tests at 0.5 capacitive Power Factor are acceptable.
** Determined by overload capacity of circuit. If unspecified test at $1.0I_{max}$.
Numbers in brackets identifies, for reference only, those tests specified in Statutory Instruments 1998 No. 1566 Schedule 1, Table 2 and Schedule 3, Table 2.

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Geometric representation of active and reactive power



NOTE 1 Diagram in accordance with clauses 12 and 14 of IEC 60375.

NOTE 2 Reference of this diagram is the current vector (fixed on right-hand line).

NOTE 3 The voltage vector *V* varies its direction according to the phase angle φ.

NOTE 4 The phase angle φ between voltage *V* and current *I* is taken to be positive in the mathematical sense (counter clockwise).

BS EN 62053 – 23*

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

Test Point	Active Meter		Reactive Meter
Value of current (I)	Cos φ		Sin φ
	Unity	0.5 Inductive	1
0.05 I_b/I_n	X (3)		
1.0 I_b/I_n	X (2), Y (5)	X (4), Y (6)	X
1.0 I_{max}	X (1)		

Notes:
These tests shall be carried out for Import/Export directions, as registered in SMRS or CMRS for a given Metering Point. If the same measuring element is used for both Import and Export one additional test point only (at 1.0 I_b/I_n, Unity Power Factor, balanced) is required in the reverse direction.
X = all elements combined.
Y = each element on its own.
X,Y means tests should be carried out on all elements combined and each element on its own.
Numbers in brackets identifies, for reference only, those tests specified in Statutory Instruments 1998 No. 1566 Schedule 1, Table 2 and Schedule 3, Table 2.

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)	Cos φ			Sin φ		
	Unity	0.5 Inductive	0.8 Capacitive*	1	0.5 Inductive	0.5 Capacitive
0.05 I_n	X (3)			X		
0.1 I_n		X	X		X	X
1.0 I_{max} or 1.2 I_n or 1.5 I_n or 2.0 I_n**	X (1)	X	X	X	X	X

Notes:
These tests shall be carried out for Import/Export directions, as registered in SMRS or CMRS for a given Metering Point. If the same measuring element is used for both Import and Export one additional test point only (at 1.0 I_n, Unity Power Factor, balanced) is required in the reverse direction.
X= all elements combined.
*Tests at 0.5 capacitive Power Factor are acceptable.
** Determined by overload capacity of circuit. If unspecified test at 1.0I_{max}.
Numbers in brackets identifies, for reference only, those tests specified in Statutory Instruments 1998 No. 1566 Schedule 1, Table 2 and Schedule 3, Table 2.

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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 > 0.1 I_n (or > 0.1 I_b for whole current Meters) and Power Factor > ± 0.8; or

2. Calibrate using an injection test when the load current < 0.1 I_n (or < 0.1 I_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 > 0.1 I_n (or > 0.1 I_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 Practice 1 and 2

Test Point	Active Meter			Reactive Meter		
Value of current (I)	Cos φ			Sin φ		
	Unity	0.5 Inductive	0.8 Capacitive*	1	0.5 Inductive	0.5 Capacitive
0.01 I_n	X					
0.02 I_n		X	X			
0.05 I_n	X(3),Y			X,Y		
0.1 I_n		X	X		X	X
1.0 I_{max} or 1.2 I_n or 1.5 I_n or 2.0 I_n**	X (1)	X	X	X		

Notes:
These tests shall be carried out for Import/Export directions, as registered in SMRS or CMRS for a given Metering Point. If the same measuring element is used for both Import and Export one additional test point only (at 1.0 I_n, Unity Power Factor, balanced) is required in the reverse direction.
X= all elements combined.
Y = each element on its own.
X,Y means tests should be carried out on all elements combined and each element on its own.
*Tests at 0.5 capacitive Power Factor are acceptable.
** Determined by overload capacity of circuit. If unspecified test at 1.0I_{max}.
Numbers in brackets identifies, for reference only, those tests specified in Statutory Instruments 1998 No. 1566 Schedule 1, Table 2 and Schedule 3, Table 2.

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Table B5: Type C Meter Calibrations for Codes of Practice 3, 5, 6 and 7

Test Point	Active Meter		Reactive Meter
Value of current (I)	Cos φ		Sin φ
	`1	0.5 Inductive	1
0.05 I_b/I_n	X (3)		
1.0 I_b/I_n	X (2), Y (5)	Y (6)	X

Notes:
These tests shall be carried out for Import/Export directions, as registered in SMRS or CMRS for a given Metering Point. If the same measuring element is used for both Import and Export one additional test point only (at 1.0 I_b/I_n, Unity Power Factor, balanced) is required in the reverse direction.
X= all elements combined.
Y = each element on its own.
X,Y means tests should be carried out on all elements combined and each element on its own.
Numbers in brackets identifies, for reference only, those tests specified in Statutory Instruments 1998 No. 1566 Schedule 1, Table 2 and Schedule 3, Table 2.

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 noted 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.

1. Accuracy Tables for Active Meters

Table C1: Summary of Class accuracy requirements for Class 0.2S and Class 0.5S Meters (single-phase Meters and polyphase Meters with balanced loads)

Value of current (I)	Power factor (Cos φ)	Percentage error limits for Meters of Class 0.2S	Percentage error limits for Meters of Class 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

Source: BS EN 62053 - 22*

Table C1(a): Summary of Class accuracy requirements for Class 0.2S and Class 0.5S Meters (polyphase Meters carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits):

Value of current (I)	Power Factor (Cos φ)	Percentage error limits for Meters of Class 0.2s	Percentage error limits for Meters of Class 0.5s
0.05In ≤ I ≤ Imax	1	±0.3	±0.6
0.1In ≤ I ≤ Imax	0.5 inductive	±0.4	±1.0

Source: BS EN 62053 – 22*

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The difference between the percentage error when the Meter is carrying a single-phase load and a balanced polyphase load at rated current I_n and unity power factor shall not exceed 0.4% and 1.0% for Meters of classes 0.2s and 0.5s respectively.
For example the maximum permitted error at I_{max} and unity power factor for a class 0.2s Meter is +/- 0.2% when the Meter is being tested under balanced load conditions and +/- 0.3% under single phase load conditions. This would allow an overall difference of 0.5% but the additional requirement limits this to 0.4% for a class 0.2s Meter.

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Table C2: Summary of Class accuracy requirements for Class 0.5, Class 1 and Class 2 Meters (single-phase Meters and polyphase Meters with balanced loads)

Value of current (I) For whole current Meters	Value of current (I) For transformer operated Meters	Power factor (Cos φ)	Percentage error limits for Meters of Class: 0.5	Percentage error limits for Meters of Class: 1	Percentage error limits for Meters of Class: 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 -

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

2. Accuracy Tables for Reactive Meters

Table C3: Summary of Class accuracy requirements for Class 2 and Class 3 Meters (single-phase Meters and polyphase Meters with balanced loads)

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

Source: BS EN 62053-23*

Table C3(a): Summary of Class accuracy requirements for Class 0.2S and Class 0.5S Meters (polyphase Meters carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits):

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

Source: BS EN 62053 – 23*

The difference between the percentage error when the Meter is carrying a single-phase load and a balanced polyphase load at basic current I_n and sin φ =1 for direct connected Meters, respectively at rated current I_n and sin φ =1 for transformer operated Meters, shall not exceed 2.5% and 3.5% for Meters of classes 2 and 3 respectively.

For example the maximum permitted error at I_n and sin φ=1 for a class 2 Meter is +/- 2.0% when the Meter is being tested under balanced load conditions and +/- 3.0% under single phase load conditions. This would allow an overall difference of 5.0% but the additional requirement limits this to 2.5% for a class 2.0 Meter.

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APPENDIX D. MEASUREMENT UNCERTAINTY

Table D1: Active Meters (Type A and C Calibrations[15])

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

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

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

[c] Figures apply to both Class 0.5 and 0.5S Meters

Table D2: Active Meters (Type B Calibrations)

Maximum overall uncertainty of Calibration equipment	Class of Meter under test 0.2S	Class of Meter under test 0.5[c]	Class of Meter under test 1	Class of Meter under test 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[14])

Maximum overall uncertainty of Calibration equipment	Class of Meter under test 2.0	Class of Meter under test 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	Class of Meter under test 3.0
Measurements at zero power factor	+/- 0.6%	+/- 1.0 %

[15] 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. The overall uncertainty of measurement shall be calculated to a 95% confidence level in accordance with UKAS Directive M3003, taking into account environmental conditions that include ambient temperature.

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Measurements at other than zero power factor	+/- 1.0%	+/- 1.5%

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APPENDIX E. ANNUAL REPORT FORMAT

E1 Meter Calibration Report for Calendar Year_____ **Meter Operator Agent_____**

Meter Make and Model	Number of Meters Calibrated Type B Cal	Number of Meters Calibrated Type C Cal	Number of Meters found to be Outside of CoP4 limits[16] Type B Cal	Number of Meters found to be Outside of CoP4 limits[17] Type C Cal	Number of Meters Adjusted	Comments[18]

[16] For Meters that are found outside of CoP4 limits of error, please provide a copy of the Calibration report on a separate sheet.
[17] For Meters that are found outside of CoP4 limits of error, please provide a copy of the Calibration report on a separate sheet.
[18] Comments shall include assumptions made during testing (e.g. tested import flow direction and Meter passed, only one test point used in export direction as the same measuring element is used by the Meter in both directions of energy flow)

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E2 Meter Sampling Report for Calendar Year_____ Meter Operator Agent_____

Meter Make and Model	No of Meters in Service	Number of Meters Calibrated (Type B Cal)	Number of Meters Outside CoP4 limitsError! Bookmark not defined.	Number of Meters Adjusted	Comments[18]

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E3 Meter End of Life Sampling Report for Calendar Year_____ Meter Operator Agent_____

Meter Make and Model	Year of Manufacture	No of Meters in Service	Number of Meters Calibrated (Type C Cal)	Accuracy Class (Active Energy)	Configuration (3ph 3w or 3ph 4w)	Meter Rating (1A or 5A)	Number of Meters Outside CoP4 limits	Comments[19]

[19] Comments shall include assumptions made during testing (e.g. tested import flow direction and Meter passed, only one test point used in export direction as the same measuring element is used by the Meter in both directions of energy flow)

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