

Schedule 19
Chapter 4
Metering Code of Practice S4
Code for the calibration, testing and commissioning requirements
of Metering Equipment for Allocation purposes
Issue 1

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**CODE FOR THE CALIBRATION, TESTING AND COMMISSIONING
REQUIREMENTS OF METERING EQUIPMENT FOR ALLOCATION**

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Superseded

Foreword

Introduction: This Metering Code of Practice ("Code") forms part of the Settlement Agreement for Scotland ("the Agreement"). In the event of inconsistency between the provisions of this Code and the other provisions of this Agreement, Clause 1.4 (Hierarchy in this Agreement) shall apply.

Technical equivalent: This Code is technically equivalent to Code of Practice 4 version 3.00 in England and Wales.

Purpose: This Code relates to the requirements for the calibration, testing and commissioning of Metering Equipment and maintaining of the associated records.

Copies: Scottish Electricity Settlements Limited ("Scottish Settlements") shall retain copies of the Code in accordance with the provisions of this Agreement.

Superseded

1. Scope

This Code states the practice that shall be employed and the apparatus that shall be used for the calibration, testing and commissioning of Metering Equipment. It shall also apply to the associated records that are to be maintained.

1.1 *The Act:* Meters that are certified under the Electricity Act 1989 shall have calibration and testing performed in accordance with the Electricity Act 1989 and shall be deemed to meet this Code.

1.2 *Meter Operator:* The obligations of the Meter Operator in respect of the requirements for calibration and testing under this Code, also extends to calibration and testing carried out on Metering Equipment at the manufacturer's works.

Frequency for both calibration and on-site accuracy tests are specified in this Code.

1.3 *Derogations:* Derogations from the requirements of this Code may be sought in accordance with Part IX (Governance of this Agreement) or may exist under Schedule 7 (Derogations) of the Agreement and those Derogations which exist under Schedule 7 and are applicable to all Parties are listed in Appendix B.

1.4 *Facilities:* The off-site and on-site facilities for calibration and testing need only satisfy the requirements for the accuracy class of Meters that are being calibrated or tested.

1.5 *Commissioning:* New Metering Systems and new Metering Equipment for existing Metering Systems shall be commissioned in accordance with this Code.

1.6 *Responsibility:* Where responsibilities and obligations contained in this Code are expressed as being responsibilities and obligations of a Meter Operator, the Associated Responsible Party shall procure that any Meter Operator appointed by it pursuant to Clause 24.2 (Appointment of Meter Operators for Bulk Supply Points) Clause 39 (Appointment of Supplier Agents) or Clause 54 (Generator Agents) complies with such responsibilities and obligations or may, if permitted to do so by the terms of this Agreement, perform such responsibilities and obligations itself.

1.7 *Nominated agent:* Where there is a reference to Scottish Settlements having a right or a duty to receive information or to provide a checking role under this Code that information may be received or that role may be performed by Scottish Settlements or any agent nominated by Scottish Settlements.

2. Application to Metering Codes of Practice

- 2.1 *Accuracy limits:* This Code specifies overall accuracy limits for Meters including those in which compensations for measurement transformer errors and/or power transformer line losses have been applied. These limits are either equal to or lower than the equivalent limits applicable to the Metering Equipment, specified in the relevant Metering Codes of Practice. Where the limits 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

- 3.1 *References:* The following documents should be referred to:-
- | | |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| National Measurement Accreditation Service ("NAMAS") | Directive NIS3003 |
| Electricity Act 1989 | Schedule 7 as amended from time to time. |
| BS 5750 | Part 3 (ISO 9003) |
| Meter Operator Code of Practice | Schedule 5 to the agreement between Meter Operators and Public Electricity Suppliers governing arrangements for safety and technical competence. |

4. Definitions

- 4.1 *Definitions:* Save as otherwise expressly provided herein, words and expressions used in this Code shall have the meanings attributed to them in Schedule 1 of the Agreement (Definitions) which for ease of reference are repeated in Appendix C.

5. Reference Standards

- 5.1 *Temperature Tolerance:*
- 5.1.1 Reference Standards, shall be maintained at the appropriate Reference Temperature within a tolerance of $\pm 2^{\circ}\text{C}$.

5.1.2 Save in so far as it is necessary to comply with the accuracy requirements of this Code, Reference Standard current transformers ("CTs") and voltage transformers ("VTs") need not be maintained at a Reference Temperature in accordance with Section 5.1.1 where it is impracticable.

5.2 *Calibration intervals:*

5.2.1 Reference Standard(s), other than Reference Standard CTs and VTs, 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.

5.2.2 Reference Standard CTs and VTs shall be calibrated by an Accredited Laboratory at intervals not exceeding 5 years. Where records are made available to Scottish Settlements or its agent, which show either a negligible or predictable deviation from previous calibrations, Scottish Settlements may in such a case permit the interval between such calibrations to be increased.

5.3 *Use:* During periods of use of a Reference Standard (i.e. between calibrations at Accredited Laboratories) satisfactory evidence shall be produced and made available to Scottish Settlements or its agent to substantiate the stability of that Reference Standard.

6. AC/DC Transfer Standards

6.1 *Temperature Tolerance:* AC/DC Transfer Standards shall be maintained at the appropriate Reference Temperature within a tolerance of $\pm 2^{\circ}\text{C}$.

6.2 *Calibration intervals:*

6.2.1 AC/DC Transfer Standards shall be verified at an Accredited Laboratory at intervals dependent on their specifications but in no case less frequently than at intervals of 24 months.

6.2.2 Where records are made available to Scottish Settlements or its agent, which show either negligible or predictable deviation from previous

calibrations, Scottish Settlements may in such a case permit the interval between such calibrations to be increased up to an interval of 5 years.

6.3 *Use:*

6.3.1 Prior to use of an AC/DC Transfer Standard (i.e. between calibrations at an Accredited Laboratory) the AC/DC Transfer Standard shall be calibrated against Reference Standards.

6.3.2 An AC/DC Transfer Standard need not be calibrated against a Reference Standard prior to use, where records are made available to Scottish Settlements or its agent, which show either negligible or predictable deviation from previous calibrations, Scottish Settlements may in such a case permit an interval between such calibrations of up to 6 months.

7. AC Transfer Standards

7.1 *Temperature Tolerance:* Save in so far as it is necessary to comply with the accuracy requirements of this Code, AC Transfer Standards need not be maintained at a given temperature.

7.2 *Calibration intervals:*

7.2.1 AC Transfer Standards need not be verified at an Accredited Laboratory provided that they have been calibrated in accordance with Section 7.2.2 or 7.2.3.

7.2.2 AC Transfer Standards shall be calibrated against Reference Standards or AC/DC Transfer Standards at monthly intervals.

7.2.3 Where records are made available to Scottish Settlements or its agent, which show either a negligible or predictable deviation from previous calibrations, Scottish Settlements may in such a case permit the interval between such calibrations to be increased up to an interval of 6 months.

7.3 *Use:* Where any AC Transfer Standard is used for on-site calibration or testing it should be calibrated before and after use. Neither the period from calibration to use nor the period from use to next calibration shall exceed one week.

7.4 *Outside specification:* When an AC Transfer Standard is calibrated and is found to be outside its specification, the reason shall be investigated and the occurrence

reported to Scottish Settlements within three (3) Working Days of its discovery. Notification shall be given to Scottish Settlements of the details and results of the investigation. The results of the investigation shall, inter alia, show:-

- 7.4.1 whether Metering Equipment calibrated or tested using that Standard since its last satisfactory calibration complies with the relevant Metering Code; and
- 7.4.2 the reason why that Standard is outside its specification.

8. Working Standards

8.1 *Temperature Tolerance:* Save in so far as it is necessary to comply with the accuracy requirements of this Code, Working Standards need not be maintained at a given temperature.

8.2 *Calibration intervals:*

- 8.2.1 Working Standards need not be verified at an Accredited Laboratory provided that they have been calibrated in accordance with Section 8.2.2 or 8.2.3;
- 8.2.2 Working Standards shall be calibrated against Reference Standards or Transfer Standards at monthly intervals; and
- 8.2.3 where records are made available to Scottish Settlements or its agent, which show either a negligible or predictable deviation from previous calibrations, Scottish Settlements may in such a case permit the interval between such calibrations to be increased up to an interval of 6 months.

8.3 *Outside specification:* When a Working Standard is calibrated and is found to be outside its specification, the reason shall be investigated and the occurrence reported to Scottish Settlements within three (3) Working Days of its discovery. Notification shall be given to Scottish Settlements of the details and results of the investigation. The results of the investigation shall, inter alia, show:-

- 8.3.1 whether Metering Equipment calibrated or tested using that Standard since its last satisfactory calibration complies with the relevant Metering Code of Practice; and
- 8.3.2 the reason why that Standard is outside its specification.

9. Location and mobility of Standards

9.1 *Location:* This Code does not require the Standards of any Meter Operator to be maintained or used at any one location.

9.2 *Mobility:* Reference standards and AC/DC Transfer Standards shall not be Mobile Standards and shall remain in one location as far as possible and only be moved for verification at an Accredited Laboratory.

AC Transfer Standards and Working Standards may be mobile Standards.

10. Accuracy requirements for the calibration and on-site testing of electricity Meters

10.1 *Standards:* Meters shall be calibrated and tested using standards complying with this Code to demonstrate compliance of such Meters with the accuracy requirements of this Agreement.

Nameplate: Whenever a Meter is calibrated or tested the relationship between the test output(s) of that Meter and the Meter Register shall be shown to comply with the marking on the Meter nameplate.

10.2 *Overall uncertainty:* The overall uncertainty of measurement during a calibration or on-site accuracy test shall be calculated in accordance with the NAMAS Directive NIS3003 allowing for all uncertainties in the chain of measurement from true value to the Meter under test. The confidence level in the determination of the overall uncertainty shall be 95% or greater.

10.3 *Calibration:*

10.3.1 Meters shall be calibrated such that the overall accuracy is within the percentage error limits as defined in Table 1 (for Meters for the measurement of Active Energy) or as appropriate Table 3 (for Meters for the measurement of Reactive Energy). The overall uncertainty of measurement of the calibration shall not exceed the limits specified in Tables 1 or 3 as appropriate.

10.3.2 All initial calibrations of Meters shall be performed in a laboratory or test house (including any Meter manufacturer's works).

(i) Periodic calibrations of all Meters other than Active Energy class 0.2S may be performed on-site provided that

the percentage error limits and overall uncertainty requirements as in Tables 1 and 3 are met.

- (ii) Periodic calibration of class 0.2S Meters for the measurement of Active Energy shall be performed in a laboratory or test house (including any Meter manufacturer's works).

10.3.3 The reference conditions for influence quantities and voltage and current balance shall be as in the appropriate Meter specification or for Class 2.0 Meters for the measurement of Active Energy as are set out under the Act.

In the case of on-site calibration adequate evidence of the influence quantity conditions applying shall be available to substantiate the calibration.

10.4 *On-site accuracy tests:*

10.4.1 Meters shall be on-site accuracy tested to demonstrate that the overall accuracy is within the percentage error limit defined in Table 2 (for Meters for the measurement of Active Energy), or Table 4 (for Meters for the measurement of Reactive Energy). The overall uncertainty of measurement of the on-site accuracy test shall not exceed the limits specified in Table 2 or 4 as appropriate.

10.4.2 Test type 1: For any Meter which measures Active Energy an on-site accuracy test may be performed by an injection test or at a prevailing load. Where a prevailing load test is performed, the load used shall be between 10% and 120% (for whole current metering percentage relates to I_{\max} and shall not exceed 100%) of Meter rated current, at a power factor between 0.8 lead and 0.5 lag. Injection tests shall be performed between 5% and 120% (for whole current metering percentage relates to I_{\max} and shall not exceed 100%) of Meter rated current, at unity power factor.

10.4.3 Test type 2: For any Meter which measures Reactive Energy an on-site accuracy test may be performed only by an injection test. Injection tests shall be performed at between 20% and 120% (for whole current metering percentage relates to I_{\max} and shall not exceed 100%) of Meter rated current at zero power factor.

10.4.4 Error limits: If any on-site accuracy test shows that the Meter is outside the required error limits then either:

- (i) the Meter shall be returned to a laboratory or test house for re-testing or re-calibration; or
- (ii) if it can be shown that the prevailing influence quantity conditions are sufficiently different to the reference conditions to have caused the Meter to be outside of the required error limits then the Meter may be left in operation only where these influence quantity conditions are temporary.

The permanent signed record shall contain the calculations and observations to justify this and shall state that those influence quantities were temporary.

10.5 *Special conditions for metering for measurement of Reactive Energy:*

10.5.1 Meters which measure Reactive Energy with a declared higher accuracy than class 2.0 are only required to meet the limits for class 2.0 Meters as in tables 3 and 4.

10.5.2 Phase-advanced Reactive hour (PARh) Meters shall be calibrated and on-site accuracy tested in their normal connection configuration. The accuracy limits in tables 3 and 4 shall apply to PARh Meters.

10.6 *Biasing:* It is expected that actual Meter errors over a group of Meters will exhibit a pattern approaching a "normal distribution". An error pattern over a group of Meters showing a consistent bias towards the extremes of the error band may need to be justified to PAAP.

11. Accuracy requirements for the testing of new or replacement measurement transformers

11.1 *Calibration and testing:* Measurement transformers shall be calibrated and tested using standards complying with this Code to demonstrate compliance of such measurement transformers with the accuracy requirements of this Agreement.

11.2 *Accuracy test:* 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 NAMAS Directive NIS 3003. In the case of measurement

transformers for Metering Code of Practice S1 and S2 applications the accuracy test result errors including measurement uncertainty shall not exceed 1.5 times the permitted errors in the relevant specifications involved (ie IEC 185 and IEC 186).

11.3 *Certificate*: Test certificates for new or replacement measurement transformers shall provide full details of the test burden conditions under which the errors were measured.

12. Frequency of calibration and testing of Metering Equipment

12.1 *Meters*:

12.1.1 Initial calibration: All Meters shall be calibrated prior to installation on-site in accordance with Section 10 and shall be provided with a traceable calibration record from a manufacturer or laboratory/test house.

12.1.2 Periodic testing:

(i) Calibration:-

(a) electromechanical Meters shall be calibrated and refurbished as necessary at intervals not exceeding 10 years. Specific maximum intervals of less than 10 years relating to particular types of Meter of accuracy class 0.5 are as below:-

<u>Manufacturer</u>	<u>Meter type</u>	<u>Interval (years)</u>
Ferranti	FLF	3
Ferranti	FMF	5
GEC	E72F	5
C&H	FN	3
C&H	KTA	3

(b) for electronic Meters the Meter Operator shall implement an evenly phased calibration schedule for each type of Meter on-circuit for which it is responsible. Over a 10 year period at least 20% of the total of each such type of Meter shall be

calibrated without adjustment and the results of such calibration shall be recorded.

Meters which are so calibrated shall then be adjusted and re-calibrated, where necessary, to comply with this Code.

The Meter Operator shall as a minimum calibrate at least one Meter of each type on-circuit for which it is responsible in accordance with this section in any 5 year period.

The result of calibration tests in accordance with this section shall be sent to Scottish Settlements for review. The PAAP shall advise Scottish Settlements of the need to revise any of the requirements of this Section 12.1.2(i).

(ii) On-site accuracy tests:-

in addition to the requirements to calibrate in Section 12.1.2(i) on-site accuracy tests shall be performed as follows:-

(a) for electromechanical Meters:-

- (1) Meters for the measurement of Active Energy of accuracy class 0.5 shall have on-site accuracy tests performed at intervals not exceeding 5 years except for the particular Meter types listed under Section 12.1.2.1(i) for which no on-site accuracy tests are required;
- (2) on-site accuracy tests are not required for all other types of electromechanical Meters.

(b) for electronic Meters:-

- (1) where the main Meters and check Meters (Metering Code of Practice S1, S2 and S3 applications) employed on a circuit are of the same manufacture and type (i.e. where the Meters are likely to have the same

failure/fault characteristics), on-site accuracy tests shall be performed on such Meters at intervals not exceeding 5 years for Meters for the measurement of Active Energy and intervals not exceeding 10 years for Meters for the measurement of Reactive Energy;

- (2) where the main Meters and check Meters employed on a circuit are of a different manufacture or type, no on-site accuracy tests shall be required on such Meters;
- (3) where only a main Meter for measurement of Active Energy is employed on a circuit (Metering Code of Practice S5 applications), on-site accuracy tests shall be performed at intervals not exceeding 10 years on such Meter; and
- (4) where only a main Meter for measurement of Reactive Energy is employed, on-site accuracy tests shall be performed at intervals not exceeding 10 years on such Meter.

12.2 *Measurement transformers:*

- 12.2.1 Initial calibration of new measurement transformers shall be prior to initial installation on any Site.

Evidence shall be made available for inspection by Scottish Settlements, in the form of a test certificate, wherever possible and economic, to show that measurement transformers comply with their accuracy class.

12.2.2 Periodic testing:

- (i) Periodic testing will not normally be required except in the case of VTs which are not provided with permanently connected voltage monitoring/alarm facilities and which

are on-circuit with demand metering and influence Transmission System losses.

- (ii) In the case of VTs falling in the exception to Section 12.2.2(i) above regular VT burden tests, or other tests approved by Scottish Settlements, which confirm the absence of fuse faults shall be performed at 6 monthly intervals. The results of such tests shall be available for inspection by Scottish Settlements.

12.3 *Outstation*: Evidence shall be made available for inspection by Scottish Settlements to demonstrate that Outstations meet the functional requirements of the relevant Metering Code of Practice.

13. Maintenance

13.1 *Routine maintenance*: Metering Equipment shall be routinely maintained in accordance with the manufacturer's recommendations or as is otherwise necessary for the Meter Operator to comply with its obligations under this Agreement.

14. Commissioning

Commissioning programme: A commissioning programme shall be performed on all new Metering Equipment which is to provide metering data for Allocation. Where replacement Metering Equipment is fitted as part of an existing Metering System a commissioning programme covering the changes shall be conducted.

Evidence: The Meter Operator shall provide such evidence as Scottish Settlements may require to confirm that, following its commissioning, Metering Equipment shall meet the requirements of this Agreement including any relevant Metering Code of Practice.

This evidence must include a signed and dated commissioning record.

Tests: Appendix A sets out those tests and checks which are expected to be included in a commissioning programme.

14.1 *Sealing*: At the completion of commissioning, Metering Equipment shall be capable of being sealed in accordance with the requirements of Schedules 8 and 9 to the Meter Operator Code of Practice.

14.2 *Metering System commissioning and proving procedure:* In the case of metering covered by a Market Procedure the Metering System shall then enter a proving procedure defined within that Market Procedure.

15. Associated records

15.1 *Records of Standards:*

15.1.1 A permanent signed record of each calibration and test of Standards employed in relation to Metering Equipment under this Code shall be maintained by the Meter Operator.

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

15.1.3 Where Standards are used on-site the overall accuracy and uncertainty measurements shall be as determined in a laboratory.

15.2 *Inspection of certificates, records and testing:*

15.2.1 Each Meter Operator shall ensure that the relevant laboratory or test house makes available on the request of Scottish Settlements all test reports, records and certificates which are required by this Code for inspection by Scottish Settlements or its Agent.

15.2.2 The results of all calibrations and on-site accuracy tests performed on Metering Equipment shall be retained as permanent signed records. The Meter Operator shall ensure that such records are made available on request to Scottish Settlements or its Agent.

15.2.3 Each Meter Operator shall ensure that the relevant records relating to quality assurance procedures in relation to Section 16 shall be made available on request to Scottish Settlements or its Agent.

16. Technical audit

16.1 *Cooperation:* The Meter Operator shall ensure co-operation by relevant laboratories or test houses or by its representative on-site, and shall itself co-operate with Scottish Settlements or its Agent during a technical audit. Such technical audit shall include

such witnessing, verification and repeat tests on any Metering Equipment or standard calibrated under this Code.

17. Quality assurance

17.1 *Quality assurance:* A quality assurance system, preferably in accordance with Part 3 of BS 5750 or ISO 9003, shall cover the activities and equipment used for calibration and testing in the laboratory or test house and for on-site accuracy checks.

17.2 *Costs:* Scottish Settlements shall have the right to establish confidence in any quality assurance system which is not in accordance with BS 5750 or ISO 9003 and recover any reasonable additional cost so incurred by it from the Meter Operator.

18. Standards of accuracy and overall uncertainty for laboratory calibration and testing of Meters for the measurement of Active Energy

18.1 *Table 1:*

18.1.1 Class of Meter 2.0 and 2.0S:

(i) For whole current and transformer operated Meters tested with transformers connected:

VALUE OF CURRENT %	POWER FACTOR	MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
5 to 100	1 unity	±0.4	±1.9
10 to 100	0.5 lagging	±0.6	±1.9
10 to 100	0.8 leading	±0.6	±1.9

18.1.1.2 For transformer operated Meters tested without transformers connected:

VALUE OF CURRENT %	POWER FACTOR	MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
5 to 120	1 unity	±0.4	±1.4
10 to 120	0.5 lagging	±0.6	±1.4
10 to 120	0.8 leading	±0.6	±1.4

18.1.2 Class of Meter 1.0 and 1.0S

VALUE OF CURRENT %	POWER FACTOR	MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
5 to 120	1 unity	±0.4	±1.0
10 to 120	0.5 lagging	±0.6	±1.0
10 to 120	0.8 leading	±0.6	±1.0

18.1.3 Class of Meter 0.5 and 0.5S

VALUE OF CURRENT %	POWER FACTOR	MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
(*)1 to 5	1 unity (*)	±0.2 (*)	±1.0 (*)
5 to 120	1 unity	±0.1	±0.5
10 to 120	0.5 lagging	±0.12	±0.6
10 to 120	0.8 leading	±0.12	±0.6

(*) Only applies to 0.5S class Meters.

18.1.4 Class of Meter 0.2S

VALUE OF CURRENT %	POWER FACTOR	MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY	
			BLANK CALIBRATED METER	COMPENSATED METER
1 to 5	1 unity	±0.10	±0.4	±0.50
5 to 120	1 unity	±0.06	±0.2	±0.25
10 to 120	0.5 lagging	±0.09	±0.3	±0.4
10 to 120	0.8 leading	±0.09	±0.3	±0.4

19. Standards of accuracy and overall uncertainty for on-site accuracy tests of Meters for the measurement of Active Energy

19.1 Table 2:

CLASS OF METER UNDER TEST	TEST EQUIPMENT MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY	
		BLANK CALIBRATED METER	COMPENSATED METER
0.2	±0.2	±0.4	±0.5
0.5	±0.2	±0.7	±0.7
1.0	±0.6	±1.6	±1.6
2.0	±0.6	±2.0	±2.0

The above table assumes the Meter is working at or about reference conditions.

20. Standards of accuracy and overall uncertainty for laboratory calibration and testing of Meters for the Measurements of Reactive Energy

20.1 *Table 3:*

20.1.1 Class of Meter 2.0

VALUE OF CURRENT % *	POWER FACTOR	MAXIMUM OVERALL % UNCERTAINTY	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
20 to 120	zero	± 0.5	± 2.0
20 to 120	0.866 lead	± 1.0	± 2.5
20 to 120	0.866 lag	± 1.0	± 2.5

* for whole current metering percentage relates to I_{max} and shall not exceed 100%.

20.1.2 Class of Meter 3.0

VALUE OF CURRENT % *	POWER FACTOR	MAXIMUM OVERALL % UNCERTAINTY	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
20 to 120	zero	± 1.0	± 3.0
20 to 120	0.866 lead	± 1.5	± 3.5
20 to 120	0.866 lag	± 1.5	± 3.5

* for whole current metering percentage relates to I_{max} and shall not exceed 100%.

21. Standards of accuracy and overall uncertainty for on-site accuracy tests of Meters for the measurement of Reactive Energy

21.1 *Table 4:*

CLASS OF METER UNDER TEST	TEST EQUIPMENT MAXIMUM OVERALL UNCERTAINTY %	PERCENTAGE ERROR LIMITS OF METER INCLUDING UNCERTAINTY
2.0	±1.0	±2.5
3.0	±1.5	±3.5

The above table assumes the Meter is working at or about reference conditions.

Superseded

Appendix A

22. Commissioning tests

22.1 *Introduction:* This Appendix sets out those tests and checks which shall be included in the commissioning programme where relevant to the type of metering. Metering Equipment shall in addition have basic tests on earthing, insulation, continuity and other tests which would normally be conducted by a Reasonable and Prudent Operator.

22.2 *Measurement transformers:* For all installations with new/replaced measurement transformers the Meter Operator shall confirm and record from site tests and inspections:-

- 22.2.1 the installed unit details including:- serial numbers, rating, accuracy class, ratio(s);
- 22.2.2 CT ratio and polarity for selected tap; and
- 22.2.3 VT ratio and phasing for each winding.

For installations with existing measurement transformers the Meter Operator shall wherever practically possible perform Sections 22.2.1, 22.2.2 and 22.2.3 above, but at a minimum must confirm and record VT and CT ratios. If the Meter Operator is not able to confirm the CT ratio on site then the Meter Operator must record the reason why on the commissioning record and liaise with the relevant Distribution (or Transmission) Business to obtain the required information.

23. Leads and burdens

23.1 *Measurement transformer leads and burdens:* For all installations the Meter Operator shall wherever practically possible:-

- 23.1.1 confirm that the VT and CT connections are correct;
- 23.1.2 confirm that the VT and CT burden ratings are not exceeded; and
- 23.1.3 determine and record the value of any burdens (including any metering burdens) for non-Allocation purposes necessary to provide evidence of the overall metering accuracy.

24. Metering

24.1 *General tests and checks:* The following may be performed on-site or elsewhere (e.g. factory, Meter test station, laboratory, etc.):-

- 24.1.1 record the Metering System details information required by the relevant Market Procedure and also that required under the Meter Operators Code of Practice;
 - 24.1.2 confirm that the VT/CT ratios applied to the Meter agree with the site measurement transformer ratios;
 - 24.1.3 confirm correct operation of Meter test terminal blocks where these are fitted (eg. CT/VT operated metering);
 - 24.1.4 check that all cabling and wiring of the new or modified installation is correct;
 - 24.1.5 confirm that Meter registers advance (and that output pulses are produced for Meters which are linked to separate Outstations) for Import and where appropriate Export flow directions. Confirm Meter operation separately for each phase current and for normal polyphase current operation;
 - 24.1.6 where separate Outstations are used confirm the Meter to Outstation channel allocations and the Meter units per pulse values or equivalent data are correct; and
 - 24.1.7 confirm that the local interrogation facility, (Meter or Outstation) and local display etc, operate correctly.
- 24.2 *Site tests:* The following tests shall be performed on site:-
- 24.2.1 check any site cabling, wiring, connections not previously checked under Sections 22, 23 and 24.1 above;
 - 24.2.2 confirm that Meter/Outstation is set to UTC within +/- 5 seconds;
 - 24.2.3 check that the voltage and the phase rotation of the measurement supply at the Meter terminals is correct;
 - 24.2.4 record Meter start readings (including date and time of readings);
 - 24.2.5 24.2.5.1 wherever practically possible, a primary prevailing load test (or where necessary a primary injection test) shall be performed which confirms that the Meter is registering the correct primary energy values and that the overall installation and operation of the metering installation is correct;
 - 24.2.5.2 where for practical or safety reasons Section 24.2.5.1 is not possible then the reason shall be recorded on the commissioning

record and a secondary prevailing load or injection test shall be performed to confirm that the Meter registration is correct including where applicable any Meter VT/CT ratios. In such cases the VT/CT ratios shall have been determined separately as detailed under 1. measurement transformers, above;

- 24.2.6 record values of the Meter/Outstation displayed or stored data (at minimum one complete half-hour value with the associated date and time of the reading) on the commissioning record; and
- 24.2.7 confirm the operation of Metering Equipment alarms (not data alarms or flags in the transmitted data).

Superseded

Appendix B: Generic Derogations

No generic Derogation applicable to this Code.

Superseded

Appendix C: Definitions

"Accredited Laboratory"	means the National Physical Laboratory (NPL), or a calibration laboratory that has been accredited by the National Measurement Accreditation Service (NAMAS), or an international laboratory recognised by NPL for the measurement required, or any other laboratory approved by the Director;
"Act"	means the Electricity Act 1989;
"Active Energy"	means the electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt-hours (Wh) and standard multiples thereof, that is 1,000 Wh = 1 kilowatt-hour (kWh) 1,000 kWh = 1 megawatt-hour (MWh) 1,000 MWh = 1 gigawatt-hour (GWh) 1,000 GWh = 1 terawatt-hour (TWh);
"Actual Metering Point"	means the physical location at which energy is metered;
"Agent"	means any person acting on behalf of a principal in performance of obligations incumbent upon a Party or Distributor in terms of this Agreement;
"Agreement"	means this Agreement (including the Recitals and the Schedules) as amended, varied, supplemented, modified or suspended from time to time in accordance with the terms hereof;
"Allocation"	means the operation of the Central Allocation System;

"Amps"	means amperes;
"Associated Responsible Party"	means the Responsible Party which appointed the relevant Agent;
"Balancing and Settlement Code"	means the Agreement of that name between NGC and others to be entered into or entered into in part implement of the reforms of the Electricity Market in England and Wales permitting physical bi-lateral contracts to be entered into between Generators and Suppliers;
"Balancing and Settlement Code Company"	means Elexon Limited (registered number 03782949) a company registered in England and Wales having its registered office at 3 rd Floor, 15 Marylebone Road, London NW1 5JD;
"Bulk Supply Point" or "BSP"	means a point of supply from a Transmission System to a:- <ul style="list-style-type: none"> (i) Distribution System; or (ii) Exempt Distribution System; or (iii) Grid-connected Composite Site; or (iv) Grid-connected Customer Site;
"Certification Regulations "	means S1792 The Meters (Certification) Regulations 1990;
"Code of Practice"	means each of the codes of practice in force in England and Wales in relation to any Metering Equipment or any part or class thereof;
"Composite Site"	means a Grid-connected Generation Site or Embedded Generation Site at which a Generator Party or Non Trading Generator:- <ul style="list-style-type: none"> (i) exports Active Energy to a Distribution System or a Transmission System; and (ii) imports Active Energy from a Distribution System or a Transmission System for purposes other than the

	generation of electrical energy;
"Co-ordinated Universal Time" or "UTC"	has the same meaning as in the document Standard Frequency and Time Signal Emission, International Telecommunication Union (CRTF.4609ISBN92-61-05311-4);
"Cumulative Reading"	means a record of the value indicated by the Cumulative Register at a given point in time;
"Customer"	means any person supplied or requiring to be supplied with electricity at premises within the BSP Group of Scottish Hydro-Electric or ScottishPower other than a person supplied or requiring to be supplied with electricity at a Power Station (save where such supply is to a Grid-connected Power Station connected to the Transmission System of one Host Company but with an auxiliary supply connected to a Distribution System in the other Host Company's BSP Group) or any person transferring electricity to or from ScottishPower's or Scottish Hydro-Electric's BSP Group (as appropriate) across an interconnector, in its capacity as such;
"Data Aggregation"	means the process of aggregating consumption figures received from Data Collectors;
"Data Collection"	means the retrieval, validation and processing of metering data;
"Data Collector"	means an Accredited person appointed by a Supplier, Generator Party or Host Company pursuant to Clause 25.1, Clause 39.1 or Clause 54.1, as the case may be, for the purposes of this Agreement;

"Defined Metering Point"	or	means the physical location at which the overall accuracy requirements are to be met, such physical location and accuracy requirements being as stated in the Metering Codes of Practice;
"DMP"		
"Demand Period"		means the period over which Active Energy, Reactive Energy or Apparent Energy are integrated to produce Demand Values for Allocation purposes and unless the context otherwise requires, each Demand Period shall be of thirty (30) minutes duration one of which will finish at 2400 hours;
"Demand Value"		means, expressed in kW, kvar, kVA, twice the value of kWh, kvarh or kVAh recorded during any Demand Period, the Demand Values are Half Hour Demands identified by the end of the Demand Period;
"Derogation"		means a derogation given in terms of Clause 93 (Derogations);
"Distribution Licence"		means a Distribution Licence granted, (or to be treated as granted) under Section 6(1)(c) of the Act;
"Distribution System"		means a system for the distribution of electrical energy as defined in the Distribution Licence of the ScottishPower Distribution Undertaking, the Scottish and Southern Energy Distribution Undertaking or any Distributor;
"Embedded"		means solely connected to a Distribution System or an Exempt Distribution System, such connection being either a direct connection or a connection via a busbar of another User;

"Export"	<p>means:-</p> <ul style="list-style-type: none"> (i) a flow of Active Energy from a Generation Site onto the Distribution System or Transmission System; or (ii) a flow of Active Energy from a BSP onto the Transmission System; or (iii) a flow of Active Energy out of Scotland despatched by ScottishPower's Grid Control Centre <p>and "Exported" shall be construed accordingly;</p>
"Generation Site"	<p>means any Grid-connected or Embedded Power Station or any Grid-connected or Embedded Composite Site as the case may be;</p>
"Generator Agent"	<p>means any Meter Operator or Data Collector appointed by a Generator Party pursuant to Clause 54.1 (Appointment of Generation Agents);</p>
"Grid-Connected"	<p>means directly connected to a Transmission System;</p>
"GWh"	<p>means gigawatt hours;</p>
"Identifier" or "Id"	<p>means a unique number and/or letter or, as the case may be, a unique combination of numbers and/or letters;</p>
"Import"	<p>means:-</p> <ul style="list-style-type: none"> (i) a flow of Active Energy to a Generation Site from the Distribution System or Transmission System; or (ii) a flow of Active Energy to a BSP from the Transmission System; or (iii) a flow of Active Energy into Scotland despatched by ScottishPower's Grid Control Centre <p>and "Imported" shall be construed accordingly;</p>

"Interrogation Unit"	means a portable computer used by Data Collectors to extract and store information from the Outstations;
"kVA"	means kilovoltamperes;
"kVAh"	means kilovoltampere hours;
"kvar"	means kilovoltamperes reactive;
"kvarh"	means kilovoltamperes reactive hours;
"kW"	means kilowatts;
"kWh"	means kilowatt hours;
"Market Auditor"	means that person or persons appointed by Scottish Settlements to audit the operation of the market pursuant to Schedule 6 (Role of the Market Auditor);
"Market Procedure"	means each of the market procedures set out in Schedules 14 (Market Procedures for General Allocation) to 18 (Market Procedure for Accreditation and Certification) as amended, varied, supplemented, modified or suspended from time to time in accordance with the terms of this Agreement;
"Maximum Demand"	means the greatest of the Demand Values recorded during a given Meter Advance Period by Metering Equipment capable of recording Demand Values in each of the Half Hours of such charging period as may be identified by a Responsible Party;
"Meter"	means a device for measuring Active Energy and/or Reactive Energy;
"Meter Operator"	means a person Accredited to install, commission, maintain and energise Metering Equipment and "Meter Operation" shall be construed accordingly;

"Meter Operator Code of Practice"	means Schedule 5 to the Agreement between Meter Operators and Distribution Businesses governing arrangements for safety and technical competence;
"Meter Register"	means a physical device for measuring Active Energy or Reactive Energy;
"Metering Code of Practice"	means each of the Scottish codes of practice relating to metering contained in Schedule 19 (Metering Codes of Practice) as amended, varied, supplemented, modified or suspended from time to time in accordance with this Agreement;
"Metering Equipment"	means Meters and, where relevant, measurement transformers (voltage, current or combination units) metering protection equipment including alarms, circuitry, their associated communications equipment and Outstations, and wiring which are part of the Active Energy and/or Reactive Energy measuring and transmitting equipment for Allocation under this Agreement;
"Metering Point"	means the point, determined according to the principles and guidance given at Schedule 9 to the Master Registration Agreement at which a supply (import) from a Distribution System and/or a Transmission System:- <ul style="list-style-type: none"> (i) is or is intended to be measured; or (ii) where Metering Equipment has been removed, was or was intended to be measured; or (iii) in the case of an Unmetered Supply, is deemed to be measured under the relevant Market Procedure(s) including MP-520, where in each case such measurement is for the

purposes of ascertaining the volumes allocated to that Supplier under this Agreement;

"Metering System"

means:-

(a) in the case of a metering system at a Bulk Supply Point, Power Station, or Composite Site (but always excluding metering systems at a Composite Site which comprise an Import Register and no Export Register), physically distinct and related Commissioned Metering Equipment at or relating to a Site which measures a trade in Active and/or Reactive Energy where the Active Energy is allocated in accordance with the Rules;

or

(b) in the case of any other metering system and, where the context requires, metering systems at Composite Sites comprising a Settlement Register, a Metering Point;

"MVA"

means megavoltamperes;

"MW"

means Megawatts;

"MWh"

means Megawatt hours;

"Outstation"

means equipment which receives and stores data from a Meter for the purpose, *inter alia*, of transfer of that metering data to a Data Collector and which may perform some processing before such transfer. This equipment may be in one or more separate units or may be integral with the Meter;

"Party"

means each person for the time being party to this Agreement whether as a Founder Signatory or pursuant to an Accession Agreement and shall

	include any successor(s) in title to or permitted assignee(s) of such person, but always excluding a Non Trading Generator and a Distributor unless expressly otherwise provided;
"Performance Assurance and Accreditation Panel"	means the body established pursuant to Clause 84.1;
"Pool"	means the electricity pool of England and Wales set up under the Pooling and Settlement Agreement as now succeeded by the trading arrangements established pursuant to the Balancing and Settlement Code;
"Power Station"	means an installation comprising one or more generating units (even where sited separately) (other than a Composite Site), owned and/or controlled by the same Generator Party or Non Trading Generator which may reasonably be considered as being managed as one power station;
"Public Electricity Supplier" or "PES"	means the ScottishPower Distribution Undertaking or the ScottishPower Supply Undertaking or the Scottish and Southern Energy Distribution Undertaking or the Scottish and Southern Energy Supply Undertaking as the case may be as specified in Schedule 3A (ScottishPower Transfer Scheme) or Schedule 3B (Scottish and Southern Energy Transfer Scheme);
"Rated Measurement Current"	means the rated primary current of the current transformers in primary plant used for the purpose of measurement;
"Reactive Energy"	means the integral with respect to time of the Reactive Power;
"Reasonable and Prudent"	means a person exercising that degree of skill,

Operator"	diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances;
"Reconciliation Run"	means any second or subsequent run of the Central Allocation System carried out by the Operating Agent for a Trading Day;
"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;
"Reference Temperature"	means a stated temperature for any apparatus at which that apparatus has a known specification. If no temperature is stated the Reference Temperature is 23°C;
"Responsible Party"	means:- <ul style="list-style-type: none"> (a) a Supplier in relation to a Metering System which is registered to that Supplier in the relevant PES Registration Service (and for the avoidance of doubt shall include any Metering System at any Grid-connected Customer Site, or Grid-connected Composite Site, so registered); <li style="padding-left: 20px;">or (b) each Transmission Business in relation to a Metering System at a Bulk Supply Point which is registered in the relevant Bulk Supply Point Registration Service (which, for the avoidance of doubt, shall not include any Metering System at a Grid-connected Customer Site or at a Grid-

connected Composite Site); or

- (c) a Generator Party in relation to a Metering System at a Registrable Generation Site which is registered to that Generator Party in the relevant Generation Registration Service (with the exception of any Metering System at such Registrable Generation Site which is a Composite Site and which comprises an Import Register or Import Registers), or a Metering System comprising a Registrable Import Register registered to it in the relevant Grid-connected Power Station (Import Registers) Registration Service;

"Scottish Company"

means Scottish Hydro-Electric or ScottishPower, as appropriate and Scottish Companies means both of them;

"ScottishPower Distribution Undertaking"

shall have the meaning given to the phrase "Distribution Undertaking" in the ScottishPower Transfer Scheme;

"ScottishPower Supply Undertaking"

shall have the meaning given to the phrase "Supply Undertaking" in the ScottishPower Transfer Scheme;

"ScottishPower Transmission Undertaking"

shall have the meaning given to the phrase "Transmission Undertaking" in the ScottishPower Transfer Scheme;

"Scottish and Southern Energy Distribution Undertaking"

shall have the meaning given to the phrase "Distribution Undertaking" in the Scottish and Southern Energy Transfer Scheme;

"Scottish and Southern Energy Supply Undertaking"

shall have the meaning given to the phrase "Supply Undertaking" in the Scottish and

	Southern Energy Transfer Scheme;
"Scottish and Southern Energy Transmission Undertaking"	shall have the meaning given to the phrase "Transmission Undertaking" in the Scottish and Southern Energy Transfer Scheme;
"Scottish Settlements"	means Scottish Electricity Settlements Limited (registered number SC 169212) a company registered in Scotland having its registered office at Delta House, 50 West Nile Street, Glasgow, G1 2NQ or such other person as is appointed as a successor to Scottish Electricity Settlements Limited in terms of Clause 13 (Appointment of successor to Scottish Settlements);
"Settlement Date"	means the calendar date of a specific Settlement Day;
"Settlement Day" or "Trading Day"	means the period beginning on the spot time of 00.00 and ending with, but not including, the spot time of 24.00, during which Active Energy is traded at any time from and after the Effective Trading Date for a BSP Group;
"Settlement Instation"	means a computer based system which collects or receives data on a routine basis from selected Outstation systems on behalf of any Party, Distributor or their Agents;
"Site"	means:- <ul style="list-style-type: none"> (a) a Transmission System Entry Point or Exit Point; or (b) a Distribution System Entry Point or Exit Point or a Bulk Supply Point; (c) the point of connection of an Exempt Distribution System or a Customer to a Distribution System or a Transmission System; and

	(d) the point of connection of two Distribution Systems;
"Standard(s)"	means any of the following: Reference Standards; AC/DC Transfer Standards; AC Transfer Standards; or Working Standards, as the context so requires;
"Supplier"	means a Party which:- <ul style="list-style-type: none"> (a) is a Founder Supplier; (b) is a supplier with an exemption under the Act; (c) is a Second Tier Supplier and who was admitted as a Party in the capacity of a Supplier; or (d) in accordance with Clause 6.8 has changed capacity such that it participates as a Party in the capacity of a Supplier ;
"Supplier Agent"	means any Meter Operator, Data Collector, Data Aggregator or Radio Teleswitch Service Access Provider appointed by a Supplier pursuant to Clause 39.1;
"System Data Provision Service"	means the system data provision service to be provided pursuant to Clause 21 (Registration Services, System Data Provision Service and Grid Control Centres);
"Transfer Standard"	means AC/DC Transfer Standard and AC Transfer Standard;
"Transmission System"	means the system for the transmission of electricity as defined in the Transmission Licences of ScottishPower Transmission Undertaking, Scottish and Southern Energy Transmission Undertaking, NGC or, in the case of NIE, the Transmission Licence granted to NIE

	pursuant to the Electricity (Northern Ireland) Order 1992;
"UTC"	means Co-ordinated Universal Time;
"Working Day" or "Business Day"	has the meaning given to that term in Section 64 of the Act when used in relation to England and Wales;
"Working Standard"	means a standard, including a complete Meter testing system, which has been verified by comparison to either a Reference Standard or a Transfer Standard, and is used for the calibration and testing of Metering Equipment;

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