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| **Balancing and Settlement Code****Code of Practice Eleven****CODE OF PRACTICE FOR ASSET METERING FOR USE IN BALANCING SERVICES REGISTRATION VALIDATION****Issue 0.1****Version 0.1****Date: 8 May 2019** |

**Code of Practice Eleven**

**CODE OF PRACTICE FOR ASSET METERING FOR USE IN BALANCING SERVICES REGISTRATION VALIDATION**

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 Eleven, Issue 0.1, Version 0.1.
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 ## xxxxxx ####.
5. This Code of Practice has been approved by the Panel.

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**AMENDMENT RECORD**

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## **Foreword**

This Code of Practice defines the minimum requirements for the Metering Equipment required for the measurement and recording of electricity at the asset. This is either based on the rated capacity of the circuit or the Maximum Demand, as applicable.

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

For the purpose of this Code of Practice the Maximum Demand of the electricity being transferred does not exceed 1MW.

For the purpose of this Code of Practice, the use of summation current transformers shall not be permitted. The use of interposing current transformers is permitted providing the overall

Asset Metering System accuracy is maintained.

Where a material change to an Asset Metering System takes place, then this Metering System must be modified to comply with the most up to date version of this Code of Practice. Changes to an Asset Metering System are considered to be material where they constitute a change to:

1. Switchgear containing measurement transformers; and/or
2. The primary plant associated with the Metering System i.e. measurement transformers.

BSCCo shall retain copies of, inter alia, this Code of Practice together with copies of all documents referred to in it, in accordance with the provisions of the Balancing and Settlement Code (“the Code”).

## Scope

This Code of Practice states the practices that shall be employed, and the facilities that shall be provided for the measurement and recording of the quantities required for Metering at the Asset which is behind the Boundary Point Metering System.

This Code of Practice specifically applies to the Metering Equipment to be installed on each circuit.

This Code of Practice applies equally to "whole current" metering and metering supplied via measurement transformers operating at high or low voltages.

## References

The following documents are referred to in the text:-

BS EN 62053-21 Electricity metering equipment (a.c.). Particular requirements. Static meters for active energy (classes 1 and 2)

BS EN 62053-22 Electricity metering equipment (a.c.). Particular requirements. Static meters for active energy (classes 0,2 S and 0,5 S)

BS EN 62053-23 Electricity metering equipment (a.c.). Particular requirements. Static meters for reactive energy (classes 2 and 3)

BS EN 50470-3 Electricity metering equipment (a.c.). Particular requirements. Static meters for active energy (class indexes A, B and C)

IEC 61557-12 Electricity metering equipment (a.c.). Particular requirements. Static meters for active energy (class indexes A, B and C)

IEC 61869-2 Instrument transformers. Additional requirements for current transformers

IEC 61869-3 Instrument transformers. Additional requirements for inductive voltage transformers

BS EN 62056-21 Electricity metering. Data exchange for meter reading, tariff and load control. Direct local data exchange

## Definitions and Interpretations

**Active Energy**

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

**Active Power**

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

1,000 Watts = 1 kW

1,000 kW = 1 MW

**Actual Metering Point**

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

**Apparent Energy**

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

**Apparent Power**

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

1,000 VA = 1 kVA

1,000 kVA = 1 MVA

**Asset Meter**

Asset Meter means a device for measuring Active Energy and/or Active Power and/or Reactive Energy and/or Reactive Power. It includes both Half Hourly Integral Outstation Meters and Meters that do not measure on a half hourly basis.

**Asset Metering Type**

Asset Metering Type means the category of Metering Equipment required to be compliant with this Code of Practice. The categories are split by the rated capacity of the circuit being measured or by the maximum demand of the energy transfers of the circuit being measured. There are four categories:

1. Asset Metering Type 1 (Metering of circuits rated greater than 100MVA);
2. Asset Metering Type 2 (Metering of circuits not exceeding 100MVA);
3. Asset Metering Type 3 (Metering of circuits not exceeding 10MVA); and
4. Asset Metering Type 4 (Metering of energy transfers with a maximum demand of up to (and including) 1MW).

**Defined Metering at the Asset Point**

Defined Metering at the Asset Point means the physical location at which the Overall Accuracy requirement as stated in this Code of Practice are to be met. The Defined Metering at the Asset Point is identified in Appendix A and relate to metering at the asset.

**Demand Period**

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

**Demand Values**

Demand Values means, expressed in MW, Mvar or MVA, twice the value of MWh, Mvarh or MVAh recorded during any Demand Period (Please note that these Demand Values are for use with Metering Systems using Asset Metering Types 1 and 2. Metering Systems using Asset Metering Types 3 and 4 shall use units a factor of 103 smaller e.g. kW rather than MW). The Demand Values are half hour demands and these are identified by the time of the end of the Demand Period.

**Electricity**

"electricity" means Active Energy and Reactive Energy.

**Export**

Export means, for the purposes of this Code of Practice, an electricity flow as indicated in Figure 2 of Appendix B.

**Half Hourly Integral Outstation Meter**

Half Hourly Integral Outstation Meter means an Asset Meter that is capable of measuring Active Energy and/or Reactive Energy in Demand Period format; and is capable of two way remote communication.

**Import**

Import means, for the purposes of this Code of Practice, an electricity flow as indicated in Figure 2 of Appendix B.

**Metering Equipment**

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

**Meter Register**

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

**Outstation**

Outstation means equipment which receives and stores data from a Meter(s) for the purpose, inter-alia, of transfer of that metering data to the relevant Data Collector as the case may be and which may perform some processing before such transfer and may be in one or more separate units or may be integral with the Asset Meter (i.e. a Half Hourly Integral Outstation Meter).

**Overall Accuracy**

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

**Password**

For Half Hourly Integral Outstation Meters: ‘Password’ means a string of characters of length no less than six characters and no more than twelve characters, where each character is a case insensitive or sensitive alpha character (A to Z) or a digit (0 to 9) or the underscore character (\_). Passwords must have a minimum of 2,000,000 combinations, for example six characters if composed of any alphanumeric characters or eight characters if composed only of hexadecimal characters (0 to F). The characters of a hexadecimal password must be in upper case.

For separate Outstations: a Password may be described as above for integral Outstations or a single password of any format (Meters separate from their Outstation and capable of external communications should have the same password requirements as for separate Outstations).

**Rated Measuring Current**

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

**Reactive Energy**

Reactive Energy means the integral with respect to time of the Reactive Power and for the purpose of the Code, is comprised of Active Export Related Reactive Energy and Active Import Related Reactive Energy.

**Reactive Power**

Reactive Power means the product of voltage and current and the sine of the phase angle between them, measured in units of voltamperes reactive and standard multiples thereof;

**Settlement Instation**

Settlement Instation means a computer based system which collects or receives data on a routine basis from selected Outstation by the relevant Data Collector.

## Measurement Criteria

Measured Quantities

For each separate circuit the following energy measurements are required for metering at the asset:-

1. Import kWh/MWh\*
2. Export kWh/MWh\*

\* Import and/or Export metering need only be installed where the circuit being metered is capable of import and/or export flows of energy.

Where the installed metering is capable of the measurement of reactive energy then for each separate circuit the following energy measurements are required for metering at the asset:-

1. Import kVArh/MVArh
2. Export kVArh/MVArh

Or if the meter is capable of four quadrant reactive measurement and reactive energy is required to be metered in that format:

1. Active Import related Import kVArh/MVArh
2. Active Import related Export kVArh/MVArh
3. Active Export related Import kVArh/MVArh
4. Active Export related Export kVArh/MVArh

Demand Values

For each separate circuit the following demand values are required for metering at the asset:-

1. Import kW/MW\*
2. Export kW/MW\*

\* Import and/or Export metering need only be installed where the circuit being metered is capable of import and/or export flows of energy.

Where the installed metering is capable of the measurement of reactive energy then for each separate circuit the following demand values are required for metering at the asset:-

1. Import kVAr/MVAr
2. Export kVAr/MVAr

Or if the meter is capable of four quadrant reactive measurement and reactive energy is required to be metered in that format:

1. Active Import related Import kVAr/MVAr
2. Active Import related Export kVAr/MVAr
3. Active Export related Import kVAr/MVAr
4. Active Export related Export kVAr/MVAr

## Accuracy Requirements

The Overall Accuracy of the energy measurements at or referred to a Metering Point for metering at the asset shall at all times be within the limits of error for the applicable Asset Metering Type as shown below:

**Table 1**: Asset Metering Type 1 (Metering of circuits rated greater than 100MVA)

|  |  |
| --- | --- |
| **CONDITION** | **LIMITS OF ERROR AT STATED SYSTEM POWER FACTOR** |
| Current expressed as a percentage of Rated Measuring Current | Power Factor | Limits of Error |
| 120% to 10% inclusiveBelow 10% to 5%Below 5% to 1%120% to 10% inclusive | 1110.5 lag and 0.8 lead | ± 0.5%± 0.7%± 1.5%± 1.0% |

**Table 2:** Asset Metering Type 2 (Metering of circuits not exceeding 100MVA)

|  |  |
| --- | --- |
| CONDITION | LIMITS OF ERROR AT STATED SYSTEM POWER FACTOR |
| Current expressed as a percentage of Rated Measuring Current | Power Factor | Limits of Error |
| 120% to 10% inclusiveBelow 10% to 5%Below 5% to 1%120% to 10% inclusive | 1110.5 lag and 0.8 lead | ± 1.0%± 1.5%± 2.5%± 2.0% |

**Table 3:** Asset Metering Type 3 (Metering of circuits not exceeding 10MVA)

|  |  |
| --- | --- |
| CONDITION | LIMITS OF ERROR AT STATED SYSTEM POWER FACTOR |
| Current expressed as a percentage of Rated Measuring Current | Power Factor | Limits of Error |
| 120% to 10% inclusiveBelow 10% to 5%120% to 10% inclusive | 110.5 lag and 0.8 lead | ± 1.5%± 2.0%± 2.5% |

**Table 4:** Asset Metering Type 4 (Metering of energy transfers with a maximum demand of up to (and including) 1MW)

|  |  |
| --- | --- |
| CONDITION | LIMITS OF ERROR AT STATED SYSTEM POWER FACTOR |
| Current expressed as a percentage of Rated Measuring Current | Power Factor | Limits of Error |
| 100% to 20% inclusiveBelow 20% to 5%100% to 20% inclusive | 110.5 lag and 0.8 lead | ± 1.5%± 2.5%± 2.5% |

The Overall Accuracy must include the errors for all Metering Equipment making up the Asset Metering System. For a high voltage Metering System this will include the Voltage Transformers, Current Transformers and the Asset Meter; for low voltage high current this will include the Current Transformers and the Asset Meter; and for low voltage low current (i.e. whole current) this will only include the Asset Meter.

**Compensation for Measurement Transformer Error**

To achieve the Overall Accuracy requirements it may be necessary to compensate Asset Meters for the error of the measurement transformers and the associated leads to the Asset Meters. Values of the compensation shall be recorded and evidence to justify the compensation criteria, including wherever possible test certificates, shall be available for inspection by the Panel or Technical Assurance Agent.

## Metering Equipment Criteria

Users of this Code of Practice shall ensure that all Metering Equipment are:

* installed and commissioned (if not already installed and commissioned); and
* maintained and operated.

### **6.1 Asset Meters**

For Asset Metering Types 1, 2 and 3 circuits shall be measured by both main and check Asset Meters where Half Hourly Integral Outstation Meters have been used.

All Half Hourly Integral Outstation Meters shall be to a format and protocol approved by the Panel in accordance with BSCP601 ‘Metering Protocol Approval and Compliance Testing’; and be static and configured to measure on a Half Hourly basis.

All Asset Meters that are **NOT** Half Hourly Integral Outstation Meters shall be to a format compliant with IEC 61557-12 and/or IEC 62053-2x, as applicable.

For each circuit Asset Meters do not need to be replaced as long as the meter continues to meet the stipulated accuracy requirements, however the meter must be re-calibrated every 10 years from the date of manufacture.

All Asset Meters shall be set to the actual primary and secondary ratings of the measurement transformers and the actual ratios displayed on the display or nameplate of the Asset Meter.

All Asset Metering Systems should include Outstation functionality and this can be either integrated or separate to the Asset Meter.

Half Hourly Integral Outstation Meters shall have the facilities, Outstation functionality and communications requirements set out in Appendix C.

All Asset Meters that are NOT Half Hourly Integral Outstation Meters shall, where the functionality is available, display cumulative energy registers, programmed measurement transformer ratios, instantaneous parameters (e.g. voltage, current, power), output values (e.g. pulse output) programmed to be sent to an Instation.

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

All Asset Meters supplied via Measurement Transformers shall be set to the actual primary and secondary ratings of the Measurement Transformers and the ratios displayed as follows:

1. for Asset Meters separate from the display and/or Outstation the ratios shall be recorded on the nameplate of the Meter; and
2. for Asset Meters combined with the display the ratios shall be displayed.
	1. Where applicable, the compensation factor that has been applied for Measurement Transformer errors and/or system losses shall be similarly displayed.

All Half Hourly Integral Outstation Meters shall include a non-volatile Meter Register of cumulative energy for each measured quantity. The Meter Register(s) shall not roll-over more than once within a six month period.

All Asset Meters that are **NOT** Half Hourly Integral Outstation Meters that have a non-volatile Meter Register that can be displayed on the Asset Meter shall be configured to display the cumulative energy for each measured quantity. The Meter Register(s) shall not roll-over more than once within a six month period.

The required minimum accuracy class that shall be installed will be to the accuracy class defined in Table 5 or Table 6, as applicable.

**Table 5:** All Half Hourly Integral Outstation Meters and Asset Meters that measure and record Energy for Asset Metering Type 1, 2, 3 and 4 metering should meet the following criteria:

|  |  |  |
| --- | --- | --- |
| Asset Metering Type | Relevant Standard | Minimum Class Accuracy |
| 1 | BS EN 62053-22 | 0.2s |
| 2 | BS EN 62053-22BS EN 50470-3 | 0.5sC |
| 3 | BS EN 62053-21BS EN 50470-3 | 1B |
| 4 | BS EN 62053-21BS EN 50470-3 | 1A |

The standards quoted are the current standards for Asset Meters at those accuracy classes. Any Asset Meter currently installed pre-dating these standards should meet the applicable standard at the time of installation.

**Table 6:** All Asset Meters that only measure and record instantaneous Active Power, this includes Asset Meters that are capable of measuring Energy but where an instantaneous Active Power output is used to provide data to an Instation, for Type 1, 2, 3 and 4 metering should meet the following criteria:

|  |  |  |
| --- | --- | --- |
| Asset Metering Type | Relevant Standard | Minimum Class Accuracy |
| 1 | IEC 61557-12 | 0.2 |
| 2 | IEC 61557-12 | 0.5 |
| 3 | IEC 61557-12 | 1 |
| 4 | IEC 61557-12 | 1 |

The standard quoted is the current standards for Meters at those accuracy classes. Any Active Power Asset Meter currently installed pre-dating these standards should meet the applicable standard at the time of installation.

### **6.2 Measurement Transformers**

For each circuit, current transformers (CT) and voltage transformers (VT) shall meet the requirements set out below.

Additionally, where a combined unit measurement transformer (VT and CT) is provided the 'Tests for Accuracy' covering mutual influence effects shall be met.

All Measurement Transformers shall be of a wound construction.

For Asset Metering Systems that represent low burdens on measurement transformers, consideration shall be given as to whether that operating burden is within the operating range of the measurement transformers. In such cases it may be necessary to add additional burden.

The total burden (i.e. working burden) on each CT and VT shall not exceed the rated burden.

Test certificates for measurement transformers showing errors at the working burden or at burdens which enable the working burden errors to be calculated shall be available for inspection by the Panel or Technical Assurance Agent.

Separately fused VT supplies shall be provided for each of the following:-

* + 1. the main Asset Meter
		2. the check Asset Meter
		3. any additional burden

Such fuses shall be located as close as practicable to the VT.

The required minimum accuracy class that shall be installed will be to the accuracy class defined in Table 7 and Table 8, as applicable.

**Table 7:** All current transformers for Asset Metering Type 1, 2, 3 and 4 metering should meet the following criteria:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Asset Metering Type | Relevant Standard | Minimum Class Accuracy | No of Sets | Configuration Requirements |
| 1 | IEC 61869-2  | 0.2s | 2 | 1 Set of CTs shall be dedicated to the Main Asset Meter only and 1 set supplying the Check Asset Meter. Check Meter CTs can be used for other purposes providing the CoP accuracy requirements are met. |
| 2 | IEC 61869-2 | 0.2s | 1 | CTs shall be dedicated to Settlement Activities supplying both Main Asset Meter and Check Asset Meter. An additional set of CTs may be fitted for the Check Asset Meter which may also be used for other purposes providing the CoP accuracy requirements are met. |
| 3 | IEC 61869-2 | 0.5 | 1 | 1 set of CTs for Main Asset Meters and Check Asset Meter for Settlement Activities purposes, but can be used for other purposes if the CoP accuracy requirements are met. |
| 4 | IEC 61869-2 | 0.5 | 1 | 1 set of CT for the Main Asset Meter for Settlement Activities, but the CTs may be used for other purposes provided the CoP accuracy requirements are met. |

The primary winding of voltage transformers shall be connected to the circuits being measured.

**Table 8:** The secondary windings of voltage transformers for Asset Metering Type 1, 2, 3 and 4 metering used for the purposes of Settlement Activities shall meet the following criteria:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Asset Metering Type | Relevant Standard | Minimum Class Accuracy | No of VTs required | Configuration Requirements |
| 1 | IEC 61869-3 | 0.2 | 2 VTs (or 1 VT with two (2) or more secondary windings) | 1 VT secondary winding dedicated to the Main Asset Meter for Settlement Activities purposes only. A second VT secondary winding for the Check Asset Meter, which may also be used for other purposes providing the CoP accuracy requirements are met. |
| 2 | IEC 61869-3 | 0.5 | 1 |  VT secondary winding shall be dedicated to Settlement Activities supplying both Main Asset Meter and Check Asset Meter. An additional VT or secondary winding may be used for the Check Asset Meter which may also be used for other purposes providing the CoP accuracy requirements are met. |
| 3 | IEC 61869-3 | 1 | 1 | 1 set of VTs for Main Asset Meters and Check Asset Meter for Settlement Activities purposes, but other uses if CoPaccuracy requirements are met. |
| 4 | IEC 61869-3 | 1 | 1 | 1 set of VTs for Main Asset Meters and Check Asset Meter for Settlement Activities purposes, but other uses if CoP accuracy requirements are met. |

The standards quoted in Table 7 and Table 8 are the current standards for measurement transformers at those accuracy classes. Any measurement transformer that was installed prior to these standards should meet the applicable standard at the time of installation.

Previous standards for Current Transformers are IEC 60044-1, IEC 185, BS 7626 and BS 3938 (1973 & 1965).

Previous standards for Voltage Transformers are IEC 60044-2, IEC 186, BS 7625 and BS 3941 (1975 & 1965).

**Measurement Transformers Installed on Existing Circuits**

Where measurement transformers, other than those newly installed, do not meet, or exceed, the minimum accuracy class specified in Tables 7 and 8 they may be used where the Asset Metering System can be demonstrated to be within the relevant Overall Accuracy allowed limits specified in Section 5 Accuracy Requirements in this Code of Practice.

## Testing Facilities

Separate test terminal blocks or equivalent facilities shall be provided for the main Asset Meters and for the check Asset Meters of each circuit. The test facilities shall be nearby the Asset Meters involved.

## Sealing

All Metering Equipment shall be capable of being sealed.

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.

## Commissioning

The Registrant, via its appointed installer, shall be responsible for the Commissioning of all Metering Equipment.

The purpose of Commissioning is to ensure that the energy flowing across a Defined Metering at the Asset Point is accurately recorded by the associated Asset 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 Asset Metering System).

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

The Commissioning tests required will depend on the type of the Metering Equipment comprised within the Asset Metering System. Appendix D specifies the minimum outputs that each test should confirm dependent on the Metering Equipment comprised within the Asset Metering System.

All Commissioning tests shall be performed on site to confirm and record the output of the Asset Metering System correctly records the energy in the primary system at the Defined Metering at the Asset Point.

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 installer to ensure that the Asset Metering System complies with the requirements of this CoP including the assessment of Overall Accuracy based on any evidence provided by other Parties.

## Proving

An end to end test shall be performed by the installer of the Asset Meter to prove that primary energy recorded by the Asset Meter (for both Main and Check Asset Meters) over a half hour period is being transferred and accurately received by the Instation.

## Record Keeping

The Registrant for the Asset Metering System is responsible for keeping the following records:

1. Calibration Test Certificates for the Metering Equipment (includes Asset Meters, current transformers, voltage transformers, as applicable);
2. Commissioning test results for the Asset Metering System (includes Asset Meters, current transformers, voltage transformers, as applicable);
3. Proving test results for the Asset Metering System;
4. Metering technical details for the Asset Metering System including, as applicable, the following:
5. Asset Meter serial numbers;
6. Asset Meter Outstation ID;
7. Asset Meter manufacturer and type;
8. Asset Meter accuracy class;
9. Asset Meter pulse multipliers;
10. Asset Meter register multipliers;
11. Asset Meter scaled output value for conversion by Instation (e.g. a pulse output value 50kWh/imp);
12. Current Transformer details (Manufacturer, type, serial numbers, ratio, rated burden, accuracy class);
13. Voltage Transformer details (Manufacturer, type, serial numbers, ratio, rated burden, accuracy class); and
14. Communications details (method, number).

This obligation is for the lifetime of the Metering Equipment making up the Asset Metering System.

## **Appendix A – Defined Metering at the Asset Point**

Defined Metering at the Asset Point example can be seen in Figure 1

*Figure 1: Asset Metering System physical location*



## **Appendix B – Import/Export Convention**

The convention for import and export Active Energy flows is defined as:

Export: Any flow of Active Energy that is coming from the Asset towards the Boundary Point Metering System

Import: Any flow of Active Energy that is coming from the Boundary Point Metering System towards the Asset.

This is illustrated in Figure 2.



## **Appendix C – Half Hourly Integral Outstation / Separate Outstation Requirements**

## **Outstation**

Where separate Outstations are provided these shall each store main and check Asset Meter data for one or more circuits and where practicable shall be configured identically.

Separate Outstations storing data from different circuits may be cascaded on to one Communication Line.

Asset Metering Systems comprising Meters with integral Outstations need not store data from the associated main or check Asset Meter.

The Outstation data shall be to a format and protocol approved by the Panel in accordance with BSCP601.

The Outstation shall have the ability to allow the metering data to be read by instations other than the Settlement Instation provided the requirements of access to data of this Code of Practice are satisfied.

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

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

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

1. 30, 20, 15, 10 and 5 minutes with one demand period ending on the hour.

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

Where the circuit the Asset Meter is connected to is not normally energised the Outstations shall be fitted with an auxiliary terminal that provides for the Outstation’s energisation for remote interrogation purposes.

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

The Outstations shall provide an alarm output signal at a manned point in the event of a supply failure.

## **Displays**

The Metering Equipment shall display the following primary information (not necessarily simultaneously):

1. Mandatory Displays:
2. Measured quantities as per clause 4;
3. Current time (“UTC”) and date;
4. Measurement transformer ratios (see clause 6.1); and
5. Any compensation factor which has been applied for measurement transformer errors and/or system losses, where this is a constant factor[[1]](#footnote-1) applied at security level 3 (i.e. where the Meter is combined with the display and/or Outstation).

Metering Equipment shall be capable of enabling the display of the following, as specified by the Registrant:

1. Display capabilities:
2. Maximum Demand (MD) for kW or MW as appropriate per programmable charging period i.e. monthly or statistical review period;
3. Maximum Demand (MD) for kVA or MVA as appropriate per programmable charging period i.e. monthly or statistical review period;
4. Twice the kWh advance or MWh advance as appropriate since the commencement of a current Demand Period (i.e. kW or MW rising demand);
5. Cumulative MD;
6. Number of MD resets; and
7. Multi-rate display sequence as specified by the Registrant with a minimum of 8 rates selectable over the calendar year. MD shall be resettable at midnight of the last day of the charging period and for part chargeable period demands. If a manual reset button is provided then this shall be sealable.

## **Data storage**

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

* + 1. A storage capacity of 48 periods per day for a minimum of 20 days for all Demand Values;
		2. The stored Demand values shall be integer values of kW/MW or kvar/Mvar as appropriate, or pulse counts, and have a resolution of better than +0.1% (at full load);
		3. The accuracy of the energy values derived from Demand Values shall be within +0.1% (at full load) of the amount of energy measured by the associated Meter;
		4. The value of any energy measured in a Demand Period but not stored in that Demand Period shall be carried forward to the next Demand Period;
		5. Where a separate Outstation is used, cumulative register values shall be provided in the Outstation which can be set to match and increment with the Meter Registers;
		6. In the event of an Outstation supply failure, the Outstation shall protect all data stored up to the time of the failure, and maintain the time accuracy in accordance with Appendix C clause 4 (Time Keeping);
		7. Partial Demand Values, those in which an Outstation supply failure and/or restoration occurs, and zero Demand Values associated with an Outstation supply failure, shall be marked so that the Settlement Instation can identify them;
		8. To cater for continuous supply failures, the clock, calendar and all data shall be supported for a period of 10 days without an external supply connected;
		9. Any “read” operation shall not delete or alter any stored metered data; and
		10. An Outstation shall provide any portion of the data stored upon request by an Instation.

## **Time Keeping**

* + 1. The Outstation time shall be set to the Universal Time Clock (UTC) also known as Greenwich Mean Time (GMT). No switching between UTC and British Summer Time (BST) shall occur
		2. Time synchronisation of the Outstation shall only be performed by communication with the Settlement Instation.
		3. The overall limits of error for the time keeping allowing for a failure to communicate with the Outstation for an extended period of 10 days shall be:-
1. the completion of each Demand Period shall be at a time which is within + 10 seconds of UTC; and
2. the duration of each Demand period shall be within + 0.1%, except where time synchronisation has occurred in a Demand Period.

## **Monitoring Facilities**

Monitoring facilities shall be provided for each of the following conditions and shall be reported, tagged wherever possible to the relevant Demand Period(s), via the local interrogation facility:-

* + 1. Error in Outstation functionality;
		2. Battery monitoring (where battery fitted); and
		3. Interrogation port access which changes data.

In addition all of the above conditions shall be reported as, at minimum, a common alarm indication via the remote interrogation facility.

## **Communications**

For integral Outstations: Outstation(s) shall accommodate both local and remote interrogation facilities, from separate ports.

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

* + 1. Level 1 Password for:

Read-only access to the following metering data, which shall be transferrable on request during the interrogation process:

1. Outstation ID;
2. Demand Values as defined in clause 4;
3. Cumulative measured quantities as defined in clause 4;
4. Maximum Demand (MD) for kW/MW or kVA/MVA as appropriate per programmable charging period i.e. monthly or statistical review period;
5. Multi-rate cumulative Active Energy as specified by the Registrant;
6. Measurement transformer ratios, where appropriate (see clause 6.1);
7. Measurement transformer error correction factor and/or system loss factor where this is a constant factor applied to the entire dynamic range of the Meter and the Meter is combined with the display and/or Outstation;
8. Alarm indications; and
9. Outstation time and date.
10. Level 2 Password for:
11. Corrections to the time and/or date; and
12. Resetting of the MD.
13. Level 3 Password for:

Programming of:

1. Displays and facilities as defined in Appendix C clause 2;
2. Measurement transformer ratios, as appropriate (see clause 6.1);
3. Measurement transformer error correction and/or system loss factor where this is a constant factor applied to the entire dynamic range of the Meter and the Meter is combined with the display and/or Outstation; and
4. Passwords for levels 1, 2 and 3.

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

1. Level 4 Password for
2. Calibration of the Metering Equipment;
3. Setting the measurement transformer ratios, where appropriate (see clause 6.1);
4. Setting the transformer error correction and/or system loss factors where this is other than a single factor; and
5. Programming the level 3 Password and the level 4 Password if appropriate.

In addition to the functions specified for each level it shall be feasible to undertake the functions at the preceding level(s); e.g. at level 3 it shall also be possible to carry out the functions specified at levels 1 and 2. This need not apply at level 4 when access is obtained via removing the cover. Different Passwords shall be utilised for each level, which shall only be circulated in accordance with the relevant BSC Procedure.

For separate Outstations: A Password shall be required to read or change any data.

The Passwords specified in Appendix C clause 6 shall be subject to the following additional requirements:

1. The communications protocol employed shall ensure that the Password offered determines the level of access to the data within the Metering Equipment.
2. A counter to log the number of illegal attempts (i.e. Password comparison failures) to access Metering Equipment via the local and remote ports shall be incorporated into the log-on process. This counter shall reset to zero at every hour change (i.e. 0100, 0200 etc).
3. If the counter reaches 7, then access is prohibited at all levels until the counter resets at the next hour change.

## **Local Interrogation**

An interrogation port shall be provided for each Outstation which preferably shall be an optical port to BS EN 62056-21, and with a serial protocol such as BS EN 62056-21, for the following purposes:-

* + 1. Commissioning, maintenance and fault finding;
		2. Transfer of metering data and alarms; and
		3. Time setting.

## **Remote Interrogation**

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

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

1. Switched telephone networks e.g. PSTN or CTN;
2. Public data networks e.g. PSN;
3. Internet Protocol;
4. Global System for Mobile communications (GSM);
5. Radio data networks e.g. Paknet or any equivalent;
6. Customer's own network;
7. Mains signalling / power line carrier;
8. Low power radio;
9. Satellite; or
10. Cable TV.

In addition any further media may be used as approved by the Panel.

The data shall be to a format and protocol approved by the Panel in accordance with BSCP601.

## **Appendix D – Commissioning Requirements**

Whole Current (Direct Connected) Metering:

* The installer will confirm that the direction of power flow is the same as is registered against the Asset Metering System for Settlement (Import or Export);
* The installer will confirm that the relationships between voltages and currents are correct and that phase rotation is standard at the Asset Meter terminals;
* The output of the Metering System correctly records the energy in the primary system at the Defined Metering at the Asset Point; and
* The installer will confirm that the Metering Equipment detects and operates the alarms required by this CoP.

Measurement Transformers (current and voltage transformers) Metering:

The equipment owner shall be responsible for ensuring the requirements of this Appendix D, 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. Where measurement transformers are owned by the Registrant or Asset Meter installer it shall be responsible for the Commissioning of all Metering Equipment.

This section assumes that the measurement transformers may not be owned by the installer of the Asset Meter or the Registrant. The equipment owner is the responsible Party for equipment housing measurement transformers associated with the Asset Metering System. Where this is not another Party, the following requirements will be the responsibility of the Registrant via its appointed Asset Meter installer.

* The equipment owner will confirm that the current transformers match the ratio and polarity declared to the installer of the Asset Meter on all relevant documentation.
* The equipment owner will confirm that the voltage transformers match the ratio and polarity declared to the installer of the Asset Meter on all relevant documentation.
* The equipment owner will confirm that the relationships between voltages and currents are correct and that phase rotation is standard at the Testing Facilities;
* The equipment owner will measure and record the burdens on the measurement transformers up to the Testing Facilities;
* The installer of the Asset Metering will confirm that the relationships between voltages and currents are correct and that phase rotation is standard at the Asset Meter terminals;
* The installer of the Asset Metering will measure and record the burdens on the measurement transformers from the Testing Facilities to the Asset Meter and ensure that the overall burden on the measurement transformers does not exceed the rated burden;
* The installer of the Asset Meter will confirm that the Asset Meters are set to the same current transformer and voltage transformer ratios as declared by the equipment owner on all relevant documentation;
* The installer of the Asset Meter will confirm that the Asset Meters have the correct Compensation for errors in the measurement transformers/connections and losses in power transformers where appropriate;
* The output of the Asset Metering System correctly records the energy in the primary system at the Defined Metering at the Asset Point; and
* The installer of the Asset Meter will confirm that the Metering Equipment detects and operates the alarms required by this CoP.

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

Current transformers[[2]](#footnote-2)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 Appendix D of the CoP (other than the requirement that the Commissioning be performed on site). On site Commissioning tests will still be required on site by the equipment owner/Asset Meter installer to ensure all of the obligations under Appendix D of this CoP are met[[3]](#footnote-3)9. Tamper evident seals shall be used following off site Commissioning and these shall be replaced on site by seals as specified in Section 8 once Commissioning is complete.

1. This excludes cases where a dynamic range of compensation factors have been applied [↑](#footnote-ref-1)
2. 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. [↑](#footnote-ref-2)
3. 9 For the avoidance of doubt, where current transformers are Commissioned off site then the equipment owner will not be required to complete additional tests outside of the scope of Appendix D of this CoP. The Asset Meter installer testing should not be altered by off site Commissioning of current transformers integrated in low voltage cut-outs or switchgear. [↑](#footnote-ref-3)