G8 - Contracts for Difference Metering

EMRS Guidance

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EMR SETTLEMENT LIMITED

LOW CARBON CONTRACTS COMPANY

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Change Amendment Record

Version	Date	Description
1.0	25 October 2015	Go Live version
2.0	15 August 2017	Document transfer to new template
3.0	11 January 2018	Updated Section 9 on the requirements for metering for a Private Network CFD. Moved figures from Appendix to the body of the document.

1. Introduction

To be able to participate in the Electricity Market Reform (EMR) Contracts for Difference (CFD) all CFD Generators must have a Metering System installed that is compliant with the CFD Agreement Terms and Conditions. This Metering System must be installed at such a point so as to exclusively measure all imports and exports of energy to and from the Facility.

The metering requirements in the CFD agreement can vary depending on the individual configuration of the CFD Generator. This can be as a result of the Generator type (e.g. Baseload, Intermittent, and Dual Scheme), building the scheme in a modular way or operating on a Private Network. Each CFD Generator will have an individual Agreement that will specify that Generator's requirements to the Low Carbon Contracts Company (LCCC); the CFD Counterparty.

EMR Settlements (EMRS), acting on behalf of LCCC, review evidence submitted to prove compliance with the Operational Conditions Precedents (OCP) related to metering (i.e. OCP 2.1 (C), (D) and (E)[1]). This guidance is only relevant to metering and the associated OCPs.

This guidance has been written to be generally relevant to all Investment Contracts and all CFD allocation round contracts. The specific metering obligations of each contract can and do vary and the reader will need to check and confirm which parts of the guidance applies to their project.

2. Purpose

The purpose of this document is to answer the following questions:

- What is the Electrical Schematic Obligation?
- What are the metering requirements for CFD Generators registered in the BSC?
- What are the metering requirements for CFD Generators registered in the BSC that are a Dual Scheme?
- What are the metering requirements for CFD Generators registered in the BSC that are Offshore Wind and building the Facility in phases?
- What are the metering requirements for CFD Generators operating on a Private Network?
- What are the test facility requirements?
- What are the Meter setup requirements?

3. Who is this document for?

This guidance document is for use by CFD Generators in understanding the requirements of the Electrical Schematic and Metering Compliance Obligations.

The evidence required to be submitted to demonstrate compliance OCP 2.1 (C), (D) and (E) is not discussed in this guidance; more information on this can be found in Guidance G21 – Operational Conditions Precedent.

[1] OCP 2.1 (C) Metering Compliance Obligation; (D) Electrical Schematic; (E) Communications Equipment

4. Associated Documents

Document
CFD Standard Terms and Conditions and all subsequent amendments applicable to the relevant CFD[2]
The Generator's CFD Agreement2 and all subsequent amendments
Private Network CFD Agreement2 and all subsequent amendments
WP33 - Working Practice Electrical Schematic Obligation[3]
WP02 - Working Practice Private Network Meter Commissioning, Proving and Calibration Tests[3]
WP24 - Working Practice CFD Settlement Required Information[2]
WP195 - Working Practice Capacity Market and CFD Metered Data[3]
G21 - Guidance Operational Conditions Precedent[2]
BSCP02 – Proving Test Requirements for Central Volume Allocation Metering Systems[4]
BSCP06 – CVA Meter Operations for Metering Systems Registered in CMRS[4]
BSCP15 – BM Unit Registration[4]
BSCP20 – Registration of Metering Systems for Central Volume Allocation[4]
BSCP514 – SVA Meter Operations for Metering Systems Registered in SMRS[4]

[2] Standard Terms and Conditions are updated for each Allocation Round. The latest Standard Terms and Conditions and template agreement can be found at https://www.gov.uk/government/publications/contracts-for-difference-standard-terms-and-conditions
[3] https://emrsettlement.co.uk/publications/working-practices/
[4] https://www.elexon.co.uk/bsc-related-documents/related-documents/bscps/

5. What is the Electrical Schematic Obligation?

The Generator is required to submit a copy of the Electrical Schematic Diagram (simplified single line diagram) to LCCC showing the locations of the Facility Metering Equipment. The location of the Meters will be associated with the location of Current Transformers (CT) and Voltage Transformers (VT) connected to the Meter. Where the Meter is direct connected or whole current the Meter itself can measure primary values without the need of Measurement Transformers.

For a Balancing and Settlement Code (BSC) Registered Metering System the Electrical Schematic Diagram must include, or be provided as a separate attachment, any relevant Meter Point Administration Number (MPAN)/Metering System ID (MSID) (for a CFD Generator that is registered with the Central Metering Registration Service (CMRS) this is the four digit MSID or for a CFD Generator that is registered within the Supplier Metering Registration Service (SMRS) this is the 13 digit core MPAN), the type of BSC approved meters and type of Communications Equipment installed.

For a CFD Generator operating on a Private Network that has no MPAN/MSID the Electrical Schematic Diagram will include details of the type of metering and Communications Equipment installed, and Meter serial numbers.

The location of the CTs and VTs should be at the Defined Metering Point (DMP) of the Facility and in such a position so as to measure net Metered Volume of the Facility. The DMP is the connection point of the Facility to the Total System (Distribution or Transmission System) or Private Network.

A basic example is illustrated in Figure 1.

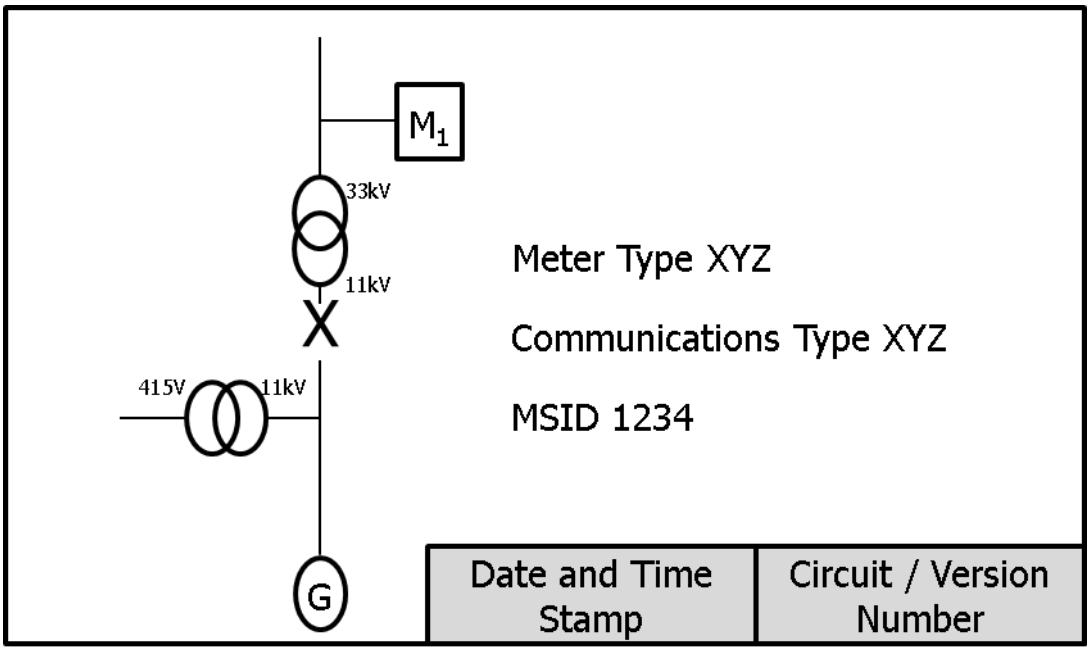


Figure 1: Electrical Schematic Diagram BSC example

If any material change to the Facility Metering Equipment occurs then the Generator is required to inform the LCCC (send an Electrical Schematic Obligation Notice[5]) within two Working Days of the change and provide an updated version of the Electrical Schematic Diagram within 10 Working Days of the change. Both the notice and the updated diagram should be accompanied by a Directors' Certificate.

A material change to a Metering System would be a change to:

1. Switchgear containing Measurement Transformers; and/or
2. The primary plant associated with the Metering System, i.e. Measurement Transformers.

[5] Template in Annex 8 of the CFD Standard Terms and Conditions

A material change for the Electrical Schematic Diagram would also include any equipment on the diagram, or supporting documents, that has been changed resulting in the original diagram, or supporting document, submitted being incorrect.

Examples of a material change are (this list is not exhaustive):

- CT or VT ratio;
- CT or VT accuracy class or rated burden;
- location of the DMP;
- switchgear / primary plant;
- type of BSC approved Meter used (for a Private Network this would be a Meter serial number change); and
- type of communications system used.

6. What are the metering requirements for CFD Generators Registered in the BSC?

6.1 Metering Requirements

The metering requirements for the Facility Metering Equipment, the Metering Compliance Obligation, is dependant on whether the Facility is operating under the Balancing and Settlement Code (BSC) or on a Private Network.

For a BSC Registered Metering System these are[6]:

'31.1 With effect from the Start Date, the Generator undertakes to the CfD Counterparty:

(A) to ensure that at all times the Facility Metering Equipment meets all applicable rules and standards provided for in the BSC;

(B) to ensure that at all times

> *(i) the Facility Metering Equipment accurately records the BM Unit Metered Volume, such BM Unit Metered Volume comprising:*
>
> > *(a) all output electricity generated by the Facility; and*
> >
> > *(b) all input electricity used by the Facility (excluding, if the Facility is a Dual Scheme Facility, the Imported Input Electricity); and*
>
> *(ii) where the Facility is a Dual Scheme Facility, the Facility Metering Equipment accurately records all Imported Input Electricity in relation to the Generating Station;*

(C) Without prejudice to Conditions 31.1(E)(i) and (F), to ensure that at all times, the Facility Metering Equipment measures the input and output electricity referred to in Condition 31.1(B) separately from any other input and output electricity; and

(D) to investigate any fault or issue with the Facility Metering Equipment of which it is notified by the CfD Counterparty or required to investigate pursuant to the BSC;

(E) to ensure at all times that no Electricity Storage Facility shall be used by or otherwise associated with the Facility, unless:

> (i) such Electricity Storage Facility is associated with a separate BM Unit to the BM Unit associated with the Facility; or
>
> (ii) subject to Condition 31.1(F), such Electricity Storage Facility is associated with the same BM Unit as that associated with the Facility and the CfD Counterparty has issued a notice

[6] The metering requirements can change between allocation rounds. This extract has been taken from CFD Standard Terms and Conditions Version 2 - https://www.gov.uk/government/publications/contracts-for-difference-standard-terms-and-conditions-version-2-march-2017. For example, Version 1 of the FiT Contract for Difference standard T&C dated 29 August 2014 had no (E) and (F). For the Investment Contracts before that the Metering Compliance condition is number 30.

certifying that it is satisfied that the arrangement and installation of the Facility Metering Equipment is such that the Generator is able to comply with the Condition 31.1(F); and

(F) to ensure at all times that any Electricity Storage Facility, where associated with the same BM Unit as that associated with the Facility, shall only store electricity generated by the Generating Unit(s) of the Facility using the Facility Generation Technology and shall not store electricity imported from any other source.

(each, a "**Metering Compliance Obligation**" and together the "**Metering Compliance Obligations**").'

For any CFD Generator that is part of the BSC Settlement System the Metering Equipment will meet the requirements as specified in the BSC Section L[7] and the applicable Code of Practice[8] (CoP), depending on the capacity of the circuit. The obligations for calibration, testing and commissioning of Metering Equipment are in CoP4. A CFD Generator can choose to exceed these requirements to install a more robust and accurate Metering System; for example by installing a Meter of a better accuracy class than the specified minimum.

A CFD Generator operating on a Private Network must meet the metering requirements of the CFD Private Network Agreement. This will be described in Section 9.

For a BSC registered Generator using their Settlement Metering System as the CFD Generator Facility Metering Equipment the metering arrangement will be compliant with the applicable CoP at the time of registration for Settlement. In CoP1 and CoP2 if there has been a significant material change (e.g. replacement of switchgear containing Measurement Transformers) the site required to upgrade to the current CoP.

The metering DMP for the CoPs is illustrated in the single line diagram (SLD) example shown in Figure 2.

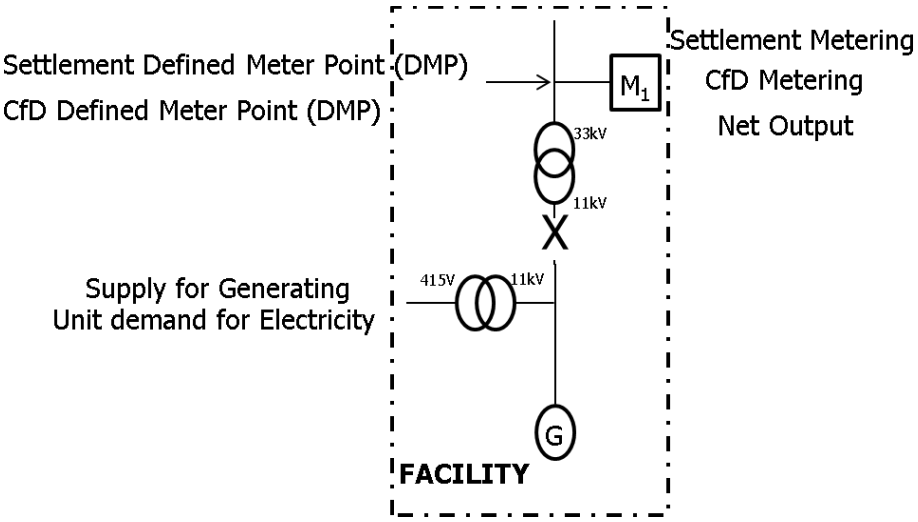


Figure 2: Single Line Diagram for a BSC Registered Site

In the example the Generator technology type is Advanced Conversion Technology and has a main Import/Export Grid Connection for the site. The Facility Metering Equipment is at the single point of connection and is Metering System[9] M_1 in the diagram.

Where a site is split between the Facility and other processes not considered to be part of the Facility the Facility Metered Volumes have to be exclusively metered. For anything that is not considered part of the Facility a separate Metering System, and registration under the BSC, would

[7] http://www.elexon.co.uk/bsc-related-documents/balancing-settlement-code/bsc-sections/
[8] http://www.elexon.co.uk/bsc-related-documents/related-documents/codes-of-practice/
[9] Only a single Meter shown in the diagram for simplicity. The Metering System requires a Main and a backup Check Meter (i.e. two Meters per circuit)

have to be provided. It is up to the LCCC to agree what is, or is not, part of the Facility. As a minimum the Facility must include all the CFD Generating Unit assets and any separate circuits that provide auxiliary load (i.e. any demand provided to allow the Facility to operate/generate) to that Generating Unit.

6.2 Meter Data Requirements

The CFD Agreement specifies that the Generator must provide Loss Adjusted Metered Output (LAMO) to the LCCC. LCCC has appointed EMR Settlement Ltd (EMRS) to receive LAMO and provide the CFD Settlement Services.

This requires Half Hourly Meters to be used to provide the data used by EMRS. Net Metered Volume is the Gross Generation less any parasitic site load used by the Generator and losses up to the metering point. For further guidance on the definition of Installed Capacity and Net Metered volume please refer to LCCC's Installed Capacity guidance[10].

For a CMRS site the Metering System will be part of a BM Unit (BMU) and EMRS will receive data via the normal Settlement process; the CFD Generator need take no action.

For a SMRS site the Metering System will have an MPAN that will be part of a Supplier's Base BMU. The CFD Generator will have to request the relevant Supplier to put the MPAN into an Additional BMU (as per BSCP15) for EMRS to receive the Metered Volumes for the Facility. Once this Additional BMU has been setup and MPANs allocated to it EMRS will receive data via the normal Settlement process.

The CFD Generator will have to provide the relevant BMU IDs to EMRS to allow them to carry out the Settlement activity. This is part of the WP24 – Settlement Required Information process and isn't discussed in this guidance.

The method for a Private Network CFD Generator is discussed in section 9.

6.3 Adjustment for losses

The LAMO is the net Metered Volume multiplied by any applicable Line Loss Factor (LLF), if connected to a Distribution System or Transmission Loss Multiplier (TLM) for every Settlement Period (i.e. every 30 minute period). For Metered Volumes submitted through a BSC process the LLF and TLM will be applied through the applicable process.

For a CFD Generator connected to a Private Network this will be done by EMRS.

6.4 Metering Faults

The CFD Generator is required under the Metering Compliance Obligation to investigate any fault or issue with the Facility Metering Equipment of which it is notified by the LCCC or required to investigate pursuant to the BSC.

Where individual items of Metering Equipment are to be replaced, then only those items need to be commissioned at that time. Metering Systems in their entirety do not need to be commissioned when items are replaced within that system unless there is a material change to the Metering System.

A material change to a Metering System would be a change to:

1. Switchgear containing Measurement Transformers; and/or
2. The primary plant associated with the Metering System, i.e. Measurement Transformers.

[10] https://lowcarboncontracts.uk/pre-generation

A material change to a CoP1 and CoP2 Metering System would result in the need to ensure that all items of Metering Equipment comprising that Metering System are compliant with the latest version of the applicable CoP.

7. What are the metering requirements for CFD Generators Registered in the BSC that are a Dual Scheme

A Dual Scheme Facility is an installation where only part of the site generation is eligible for a CFD Agreement. In this instance the Facility is the CFD Generator and the Generating Station is the whole site (i.e. including both the CFD Generator Unit and at least one other Generator Unit that is not part of the Facility).

The net Metered Volume is the Gross Generation of the Facility less the Estimated Imported Electricity Allowance. If the CFD contract specifies either a Renewable Qualifying Multiplier (RQM) or a Combined Heat and Power Qualifying Multiplier (CHPQM) the LAMO is multiplied by this factor.

The Estimated Imported Electricity Allowance is a calculation of the proportion of imported electricity used by the Facility. It is only to be used when the Facility demand for electricity cannot be measured separately from the demand of the Generating Station. The metering arrangement for this scenario is illustrated in the SLD in Figure 3.

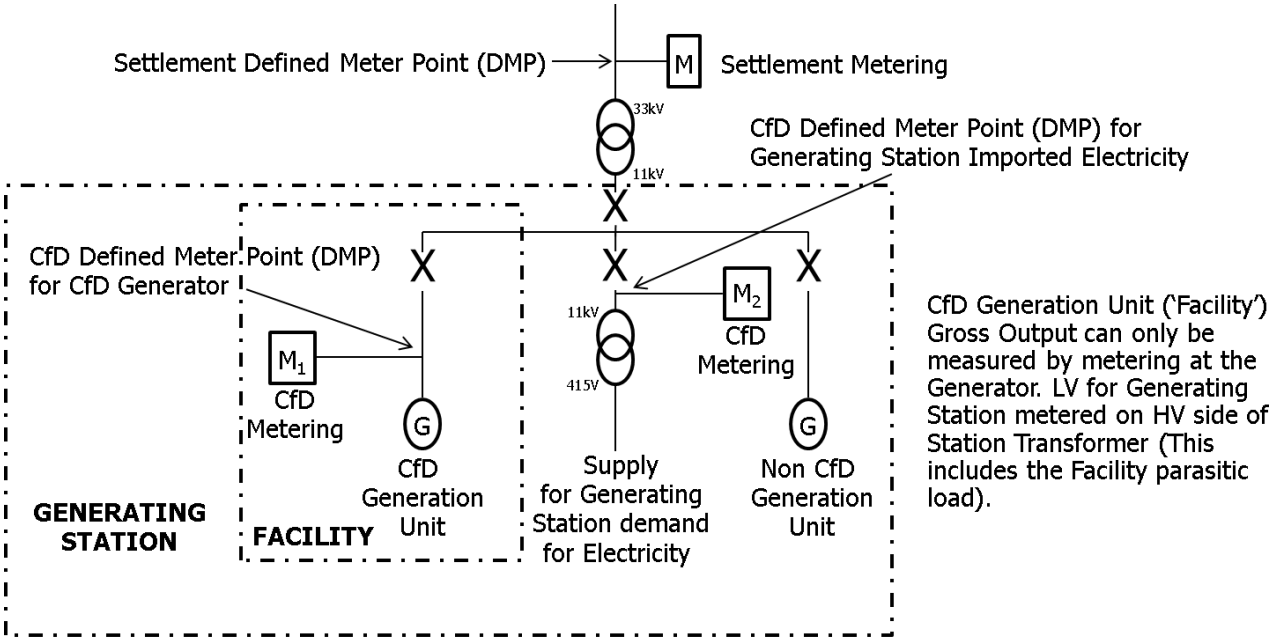


Figure 3: Dual Scheme Facility

From that example it can be seen that the imported electricity for the Generating Station is measured by Meter M_2. To calculate the Estimated Imported Electricity Allowance the following calculation is performed:

$$\text{Estimated Imported Electricity Allowance(MWh)} = AI[M_2] \times \frac{B}{C}$$

Where;

$AI[M_2]$ is the total Imported Input Electricity (MWh) used by the Generating Station in that Settlement Unit (i.e. 30 minute period);

B is the lesser of the Installed Capacity (MW) and the Maximum Contract Capacity (MW) of the Facility as at such Settlement Unit. This is for the CFD Generator.

C is the aggregate capacity (MW) of all Generating Units (including CFD Generator) comprising the Generating Station as at such Settlement Unit.

If the Dual Scheme is part of the BSC Settlement System the Metering Equipment will meet the requirements as specified in the BSC as described in section 6.1.

8. What are the metering requirements for CFD Generators Registered in the BSC that are Offshore Wind and building the Facility in Phases?

A site that is an Offshore Wind Farm that intends to build in a modular phased way over a period of years will have to meet the requirements of either the Single Metering or Apportioned Metering Phasing Agreement.

If the Offshore Wind Farm is part of the BSC Settlement Metering System then the Metering Equipment will meet the requirements as specified in the BSC as described in section 6.1. See the Metering for Offshore Wind Farms Guidance Note[11] for more information on the requirements under the BSC.

8.1 Single Metering Phasing

In the Single Metering option each phase of the project must separately and accurately record the net Metered Volumes. A phase has to be made up of a single BMU or multiple BMUs, where those BMUs are only associated with turbines for a single phase of the project. So in the SLD example shown in Figure 4 Phase 1 was completed in 2015, Phase 2 in 2017 and Phase 3 in 2019 and each of these phases has a compliant Metering System installed to record the net generation of each phase.

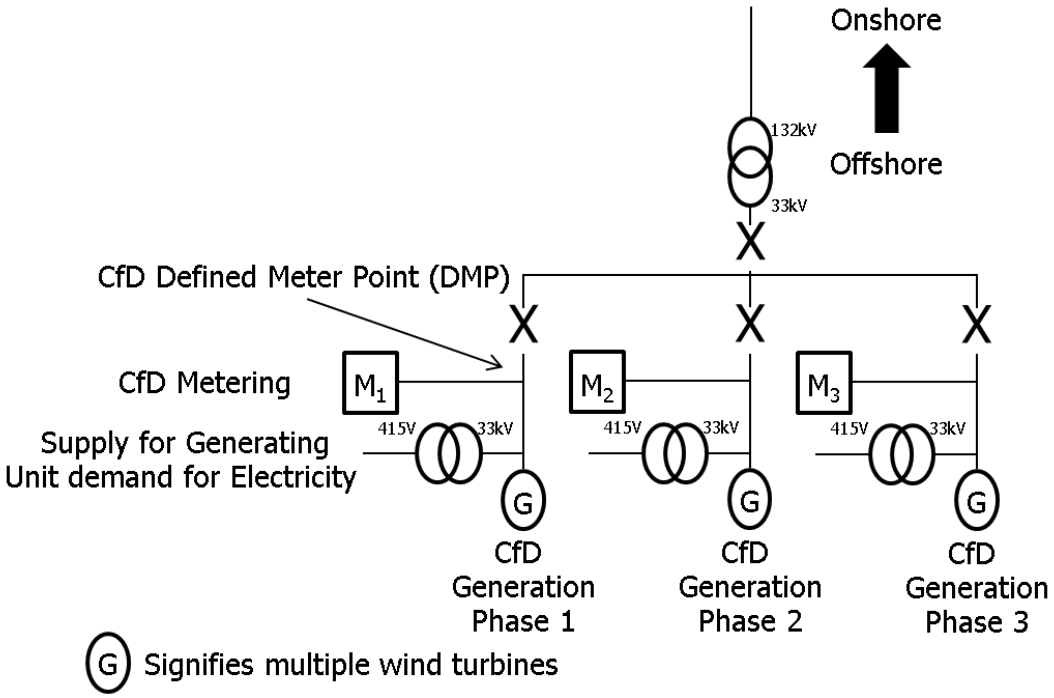


Figure 4: Single Metering

[11] https://www.elexon.co.uk/bsc-related-documents/bsc-guidance-notes/

8.2 Apportioned Metering Phasing

The Apportioned Metering CFD variant amends the same standard terms and conditions used by single metered CFDs. In the Apportioned Metering option net Metered Volume is recorded for the whole project (i.e. all phases). This is achieved via one central metering point, as illustrated in the SLD in Figure 5. The total Metered Volume from that central point is then apportioned to each individual phase based on the overall functionality of that phase.

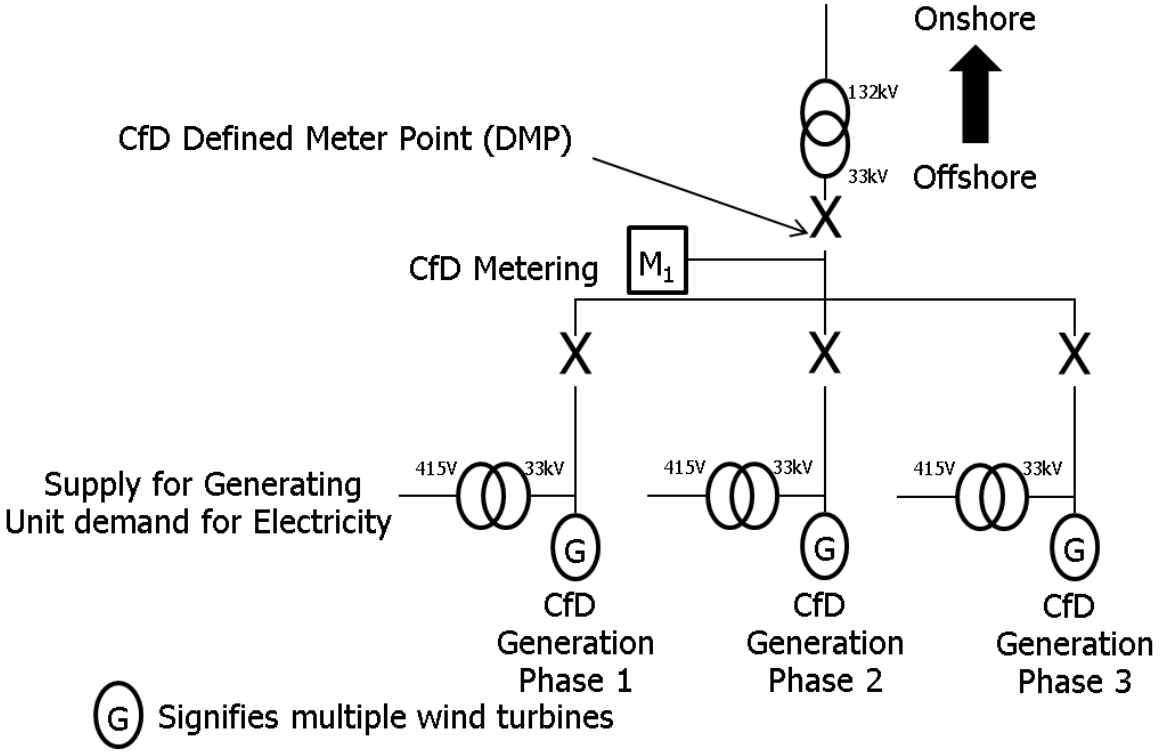


Figure 5: Apportioned Metering

The Metered Output in this case is the LAMO multiplied by the apportionment percentage of the relevant phase. The apportionment percentage for the relevant phase is the sum of the turbine installed capacity available to operate in that Settlement Unit of the relevant phase divided by the sum of the turbine installed capacity available to operate in that Settlement Unit of all the phases.

In addition to the Facility Metering Equipment the Generator must install an Information and Monitoring System to identify the Active Turbines for each phase and from that determine the apportionment percentage to be calculated.

9. What are the metering requirements for CFD Generators operating on a Private Network?

9.1 Metering Requirements

A Generator that doesn't have a direct connection to the Total System (either Distribution or Transmission System) is considered to be operating on a Private Network. The Private Network will have a connection to the Total System. The Boundary Point of the Facility is the connection point to that Private Network.

There are two types of generator that can operate on a Private Network:

- Hybrid Generator – A Generator that has access to a Grid Connection and has a Market Supply Agreement with an Onsite Customer; and

- Islanded Generator – A Generator that has a Market Supply Agreement with an Onsite Customer but which does not have access to a Grid Connection.

For a Metering System on a Private Network the typical[12] metering requirements are:

'31.1 With effect from the Start Date, the Generator undertakes to the CfD Counterparty:

(A) to comply at all times with the MOF and the TSRs;

(B) where the Facility is a Dual Scheme Facility, to ensure that at all times the Boundary Point Metering System meets all applicable rules and standards provided for in the BSC;

(C) to ensure that at all times:

(i) the Facility Metering Equipment accurately records the Metered Volume; and

(ii) where the Facility is a Dual Scheme Facility, the Boundary Point Metering System accurately records all Imported Input Electricity in relation to the Generating Station;

(D) Without prejudice to Conditions 31.1(H)(ii) and (I), to ensure that at all times the Facility Metering Equipment measures the input and output electricity referred to in Condition 31.1(C) separately from any other input and output electricity;

(E) to investigate any fault or issue with the Facility Metering Equipment of which it is notified by the CfD Counterparty or otherwise required to investigate pursuant to the MOF and the TSRs;

(F) to provide to the CfD Counterparty (or procure that the CfD Counterparty is provided with) the Metered Volume in relation to each Settlement Unit by the Metered Output Cut-Off Time;

(G) if the Facility is a Dual Scheme Facility, to provide to the CfD Counterparty (or procure that the CfD Counterparty is provided with) the Imported Input Electricity in relation to each Settlement Unit by the Metered Output Cut-Off Time;

(H) to ensure at all times that no Electricity Storage Facility shall be used by or otherwise associated with the Facility, unless:

(i) the electricity produced by or from such Electricity Storage Facility is measured by metering equipment which is not used by or shared or associated with the Facility Metering Equipment; or

(ii) subject to Condition 31.1(I), the electricity produced by or from such Electricity Storage Facility is measured by metering equipment which is used by or shared or associated with the Facility Metering Equipment and the CfD Counterparty has issued a notice certifying that it is satisfied that the arrangement and installation of the Facility Metering Equipment is such that the Generator is able to comply with the Condition 31.1(I); and

(I) to ensure at all times that any Electricity Storage Facility, where the electricity produced by or from such Electricity Storage Facility is measured by metering equipment which is used by or shared or associated with the Facility Metering Equipment, shall only store electricity generated by the Generating Unit(s) of the Facility using the Facility Generation Technology and shall not store electricity imported from any other source.

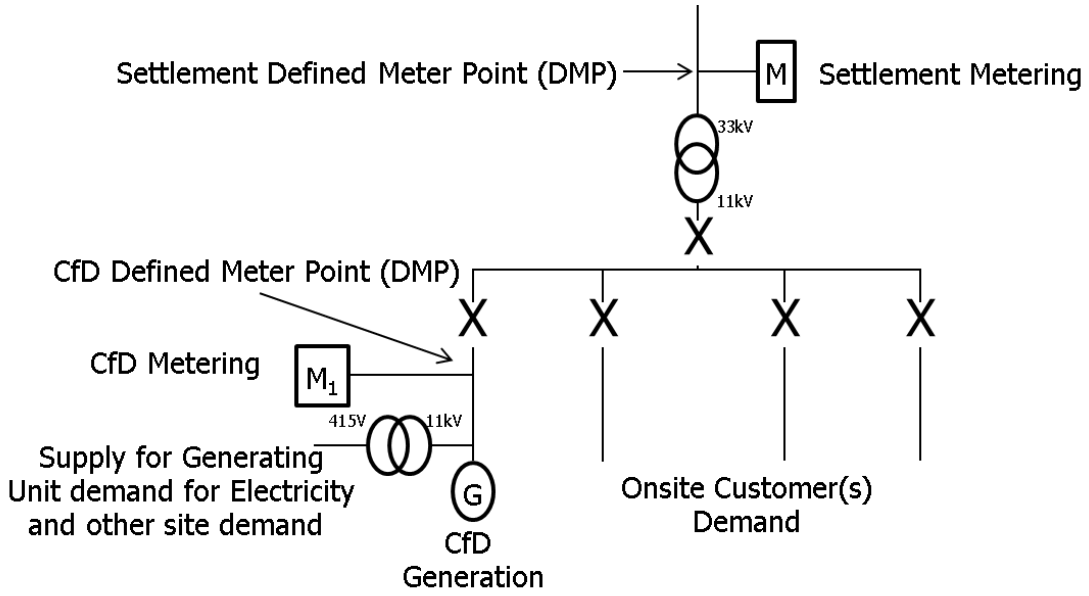
*(each, a "**Metering Compliance Obligation**" and together the "**Metering Compliance Obligations**")'.*

Where the MOF is the Metering Operational Framework (Annex 6 to the Private Network CFD Agreement) and the TSR is the Technical System Requirements (Annex 7 to the Private Network CFD Agreement)

[12] The extract quoted above is taken from CFD Private Network Agreement Version 2 - https://www.gov.uk/government/publications/contracts-for-difference-standard-terms-and-conditions-version-2-march-2017. There are no private wire agreements from the first Allocation Round or the Investment Contracts.

In the CFD Agreement the Generator is referred to as the Facility and the Metering System used to measure net Metered Volume is the Facility Metering Equipment. The DMP is at the Boundary Point(s) of the Facility.

The preferred solution is for the point of measurement (i.e. CTs and VTs) to be located at this point so one Metering System is measuring the net Metered Volume of the Facility, as illustrated in the SLD in Figure 6.



Loss Adjusted Metered Output (LAMO) = MV x LLF x TLM = AE[M_1] x LLF x TLM

Metered Output = LAMO x RQM x CHPQM = LAMO x RQM x CHPQM

Figure 6: Private Network – Single Metering System

Subject to approval by the LCCC the net Metered Volume of the Facility can be measured by multiple Meters and the net Metered Volume can be calculated. This would be where there is an additional circuit separately metered that is providing auxiliary load to the Facility, as illustrated in the SLD in Figure 7.

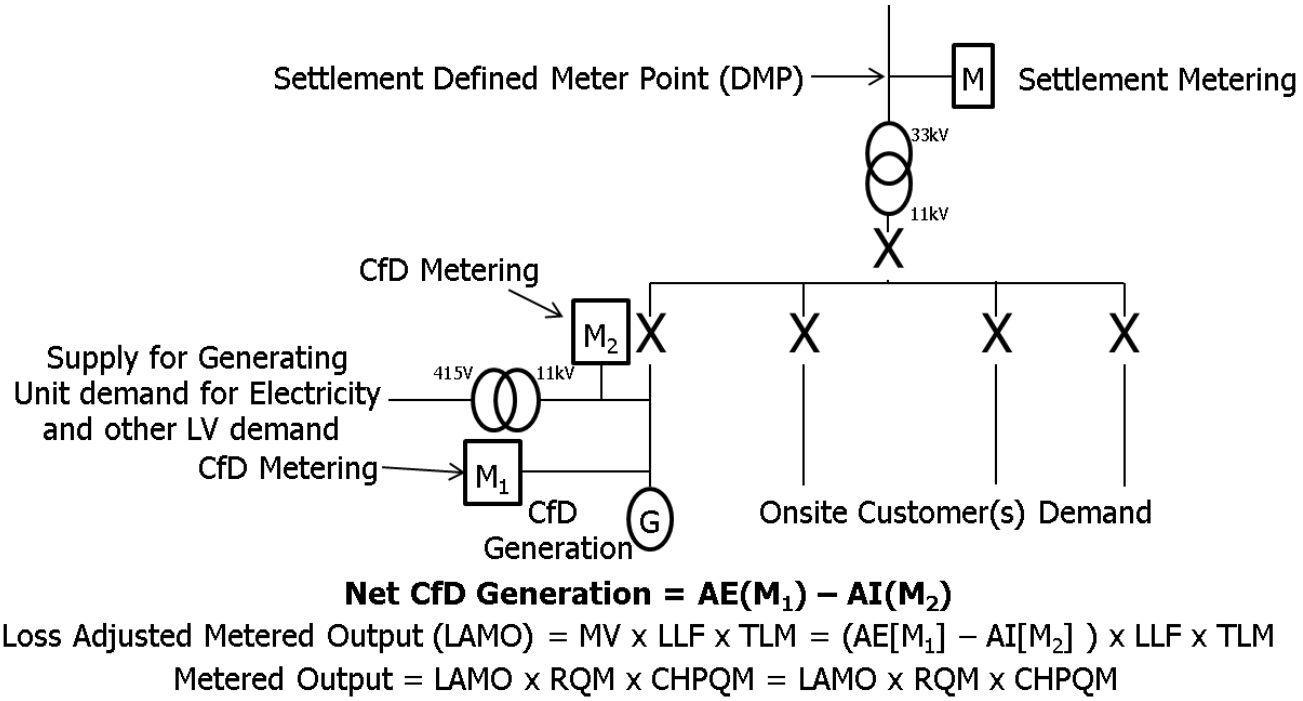


Figure 7: Private Network – Multiple Metering Systems

From these Meters the net Metered Volume can be derived as follows:

Net Metered Volume(MWh)=Gross Generation(MWh)-Auxiliary Load(MWh)

This is not the preferred option of the LCCC but an option that will be allowed if the LCCCs nominated representative is satisfied either from the SLD or at the witnessing of commissioning and proving tests of the Metering System that net Metered Volume can be accurately recorded and reported.

The Meter must be connected so that it is normally energised to allow interrogation for EMR settlement purposes.

It is recommended for a Data Collector (e.g. a Half Hourly Data Collector operating in the BSC) to download the Metered Volumes daily and submit the data, in a defined format, to EMRS.

A CFD Generator operating on a Private Network must meet the additional requirements of the Private Network Metering Operational Framework (MOF) and the Technical System Requirements (TSR) in their CFD Agreement (Annex 6 & 7)[13]. This includes the minimum specification that the Metering Equipment requires to be and the testing and commissioning requirements.

The Generator is responsible for sealing of the Metering Equipment. This includes the Meters, Outstation, panel doors, potential fuses and test terminal facilities if not contained within a metering panel. A Re-Sealing Form (MOF Appendix 1) must be maintained and updated by the Generator. If any seal is broken or damaged the LCCC shall be notified.

9.2 Metering Equipment

Any Generator can choose to exceed the requirements specified in the TSR and install a more robust and accurate Metering System; for example by installing a Meter of a better accuracy class than the specified minimum.

The TSR is split into three Metering Types based on the rated capacity of the circuit:

[13] https://www.gov.uk/government/publications/contracts-for-difference-standard-terms-and-conditions

1. Metering Type 1 - for circuits rated greater than 100MVA;
2. Metering Type 2 - for circuits rated up to 100MVA and rated greater than 10VA; and
3. Metering Type 3 - for circuits rated up to 10MVA.

It will depend on what Metering Type category a Facility falls into as to what Metering Equipment will have to be installed and what limit of Overall Accuracy will be applicable.

The requirements for CTs can be seen in Table 1. All CTs should be manufactured to the current IEC standard at the time of installation (currently IEC 61869-2 in 2017).

Table 1: Current Transformers

Metering Type	Minimum Accuracy Class	Configuration Requirements
1	0.2s	One set of CTs for the Main Meter and a second set for the Check Meter (per circuit)
2	0.2s	One set of CTs for the Main and Check Meters (per circuit)
3	0.5	One set of CTs for the Main and Check Meters (per circuit)

The requirements for VTs can be seen in Table 2. All VTs should be manufactured to the current IEC standard at the time of installation (currently IEC 61869-3 in 2017).

Table 2: Voltage Transformers

Metering Type	Minimum Accuracy Class	Configuration Requirements
1	0.2	One set of VTs, or dedicated secondary winding for the Main Meter and a second set, or separate secondary winding, for the Check Meter (per circuit)
2	0.5	One set of VTs, or dedicated secondary winding for the Main and Check Meters (per circuit)
3	1.0	One set of VTs for the Main and Check Meters (per circuit)

The requirements for Meters can be seen in Table 3. All Meters should be manufactured to the current IEC standard at the time of installation (currently IEC 62053-22 for Class 0.2s and 0.5s; IEC 62053-21 for Class 1.0 in 2017). It is recommended to use a Meter that has been approved under the BSC for Half-Hourly Settlement for the equivalent CoP as this meets all the requirements of the TSR.

Where:

- Metering Type 1 is equivalent to CoP1;
- Metering Type 2 is equivalent to CoP2; and
- Metering Type 3 is equivalent to CoP3.

The CoP Compliance and Protocol Approval List[14] can be found on the ELEXON website. The Compliance section of the list has separate columns for CoP1, CoP2 and CoP3 that confirm whether a Meter Type is approved for that CoP.

Table 3: Meters

Metering Type	Minimum Accuracy Class	Configuration Requirements
1	0.2s	Main and Check Meter required (per circuit)
2	0.5s	Main and Check Meter required (per circuit)
3	1.0	Main and Check Meter required (per circuit)

Where the Meter has been approved under the Measurements Instrument Directive (MID) the relevant standard is IEC 50470-3 where Class C is equivalent to Class 0.5s and Class B is equivalent to Class 1.0. It should be noted that there is no MID equivalent to a Class 0.2s Meter required under Metering Type 1.

In addition to the individual equipment requirements for accuracy the Metering System in its entirety must be within the Overall Accuracy limits, as specified in Table 4. So the combined error of the Meter, CT and VT must be within the allowed limits for Overall Accuracy, It is possible to compensate the Meter for the Measurement Transformer (i.e. CT and VT) errors to bring the Overall Accuracy within the allowed limits.

Table 4: Overall Accuracy Limits

Metering Type	Condition	Limits of error at stated system power factor	
	Current expressed as a % of Rated Measuring Current	Power Factor	Limits of Error
1	120% to 10% inclusive	1	±0.5%
	Below 10% to 5%	1	±0.7%
	Below 5% to 1%	1	±1.5%
	120% to 10% inclusive	0.5 lag and 0.8 lead	±1.0%
2	120% to 10% inclusive	1	±1.0%
	Below 10% to 5%	1	±1.5%
	Below 5% to 1%	1	±2.5%
	120% to 10% inclusive	0.5 lag and 0.8 lead	±2.0%
3	120% to 10% inclusive	1	±1.5%
	Below 10% to 5%	1	±2.0%
	120% to 10% inclusive	0.5 lag and 0.8 lead	±2.5%

[14] Location of the CoP Compliance and Protocol Approval List - https://www.elexon.co.uk/bsc-and-codes/bsc-related-documents/codes-of-practice/

9.3 Private Network Operational Conditions Precedent

In the Private Network Agreement the Operational Conditions Precedent for OCP (C), (D) and (E) are different from the standard terms and conditions[15], see below:

'(C) evidence, in form and content satisfactory to the CfD Counterparty, acting reasonably, that the Generator is complying in full with the Metering Compliance Obligations, which shall include:

(i) a manufacturer's certificate given by the manufacturer of each Meter and Measurement Transformer confirming that they have been calibrated, meet the accuracy and measurement range requirements set out in the TSRs and conform with relevant product standards appropriate to the class index of the Meters and Measurement Transformers;

(ii) a Directors' Certificate confirming that each of the Meters and the Measurement Transformers has been calibrated, installed, commissioned, proved and tested in accordance with the manufacturer's instructions;

(iii) a Key Meter Technical Details Form; and

(iv) a report from a suitably qualified person, approved by the CfD Counterparty, confirming that the Facility Metering Equipment has satisfied all the applicable tests required to be completed prior to the Start Date pursuant to the MOF and the TSRs;

(v) a report from a suitably qualified person, approved by the CfD Counterparty, confirming that no Electricity Storage Facility is being used by or otherwise associated with the Facility, unless:

(a) the electricity produced by or from such Electricity Storage Facility is being measured by metering equipment which is not used by or shared or associated with the Facility Metering Equipment; or

(b) subject to Condition 31.1(I), where the electricity produced by or from such Electricity Storage Facility is being measured by metering equipment which is used by or shared or associated with the Facility Metering Equipment, the CfD Counterparty has issued a notice certifying that it is satisfied that the arrangement and installation of the Facility Metering Equipment is such that the Generator is able to comply with the Condition 31.1(I); and

(vi) a report from a suitably qualified person, approved by the CfD Counterparty confirming that where electricity produced by or from an Electricity Storage Facility is being measured by metering equipment which is being used by or shared or associated with the Facility Metering Equipment, such Electricity Storage Facility is only storing electricity generated by the Generating Unit(s) of the Facility using the Facility Generation Technology and does not store electricity imported from any other source.

(D) a date and time stamped copy of the electrical schematic diagram, certified as being correct and up-to-date by a director of the Generator and showing the locations of the Facility Metering Equipment associated with all assets comprised within the Facility (including: details of the type of metering and Communications Equipment installed in compliance with the Metering Compliance Obligation; and the Meter Serial Number for each of the Meters); and

(E) evidence, in form and content satisfactory to the CfD Counterparty, acting reasonably, that all Communications Equipment relating to Facility Metering Equipment is satisfactorily installed, commissioned, configured, operational, maintained, tested and are fully compliant with the applicable TSRs.'

The Key Meter Technical Details are the Meter serial numbers, the Outstation number of channels, the measurement quantity ID (e.g. AE for Active Export), the Meter multiplier, the pulse multiplier, the CT and/or VT serial numbers and the CT and/or VT ratios.

[15] See clause 9.4 of the Private Network CFD agreement https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/599106/FINAL_Private_Network_CfD_Agreement__with_footnotes__-_13_March_2017.pdf

9.4 Adjustment for Losses

The LAMO will be adjusted for LLF and TLM by EMRS. LLF shall be applied based on the voltage class of the Facility. The voltage class is the voltage (kV) level at the connection point of the Facility to the Private Network. The LLF used will be an LLF for equivalent voltage level in that Grid Supply Point (GSP).

TLM will be applied based on the GSP the Facility is located.

9.5 Metering Faults

The CFD Generator is required under the Metering Compliance Obligation to investigate any fault or issue with the Facility Metering Equipment of which it is notified by the LCCC or otherwise required to investigate pursuant to the MOF and the TSRs.

Where individual items of Metering Equipment are to be replaced, then only those items need to be commissioned at that time. Metering Systems in their entirety do not need to be commissioned when items are replaced within that system unless there is a material change to the Metering System.

A material change to a Metering System would be a change to:

1. Switchgear containing Measurement Transformers; and/or
2. The primary plant associated with the Metering System, i.e. Measurement Transformers.

A material change to a Metering System would result in the need to ensure that all items of Metering Equipment comprising that Metering System are compliant with the latest version of the MOF / TSR.

10. What are the test facility requirements?

For any CFD Generator that has its Metering Equipment registered in Settlements the test facilities must meet the requirements as specified in the applicable CoP[16] as a minimum, depending on the capacity of the circuit.

For any CFD Generator that is operating on a Private Network the test facilities must meet the requirements of the MOF and the TSR specified in the terms of the CFD Agreement as a minimum, depending on the capacity of the circuit.

The Meter(s) are connected to the secondary side of the CTs and/or VTs via test terminal facilities and in the case of voltage connections also via fuses. These facilities should be configured so as to allow the Meter(s) to be isolated while the circuit is energised for test purposes or replacing the Meters.

For CoP1 and CoP2 Metering Systems (and Type 1 Metering Systems on Private Networks) separate testing facilities shall be provided for the main and check Meters, this allows one Meter to be worked on or removed while the other continues to measure the prevailing load. For CoP3 Metering Systems (and Type 2, Type 3 Metering Systems on Private Networks) testing facilities shall be provided close by the Meters of each circuit.

If the option of using a second set of CTs for the check Meters is used in a Private Network Type 2 site separate testing facilities will be required for the main and check Meters. Effectively the testing facilities required are a separate test facility for each set of metering CTs. For all situations the Meters are separately fused. This is a minimum requirement and any CFD Generator in a CoP3 site or a Type 2, Type 3 Private Network site can install separate testing facilities for the main and check Meters should they wish, irrelevant of the number of sets of metering CTs installed.

[16] http://www.elexon.co.uk/bsc-related-documents/related-documents/codes-of-practice/

Examples of test facilities can be seen in Figures 10, 11 and 12.

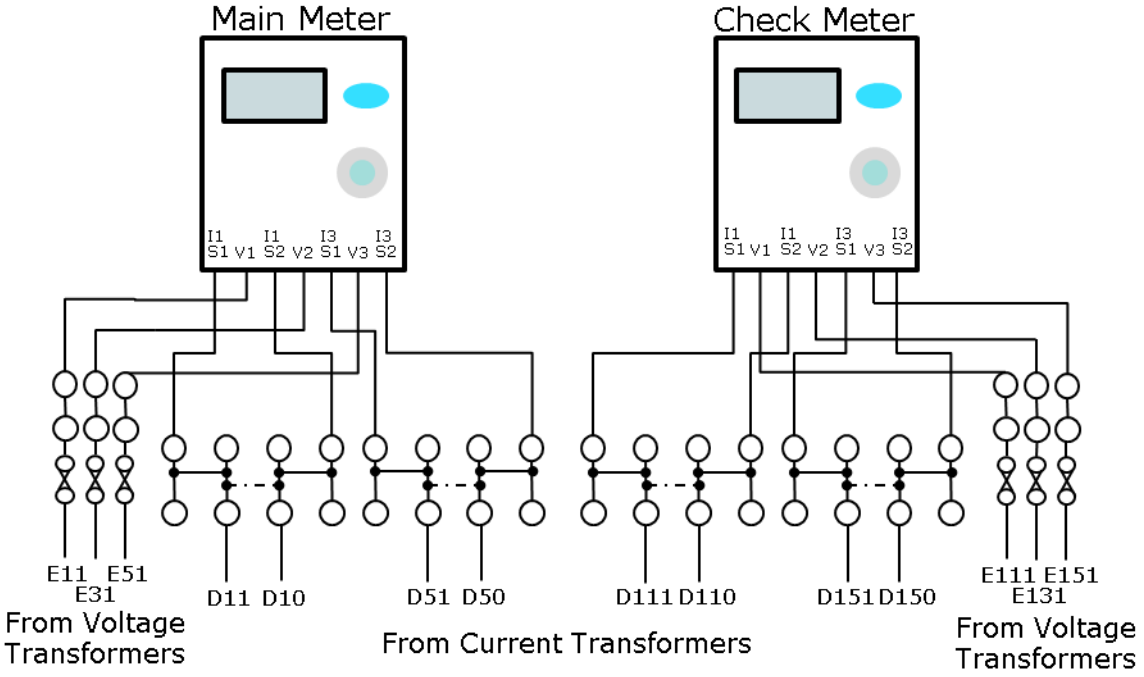


Figure 10: Test Facilities Example - CoP 1 and Private Network Type 1

Figure 10 is an example of the minimum testing facilities required for a CoP1 and a Private Network Type 1 installation. A set of multi-core cables will come from the main VT or main winding for the main Meter and another set of multi-core cables will come from the check VT or check winding for the check Meter. Any other burden connected to the VT would be connected to the check winding and separately fused.

A set of multi-core cables will come from the main CT or main winding for the main Meter and another set of multi-core cables will come from the check CT or check winding for the check Meter.

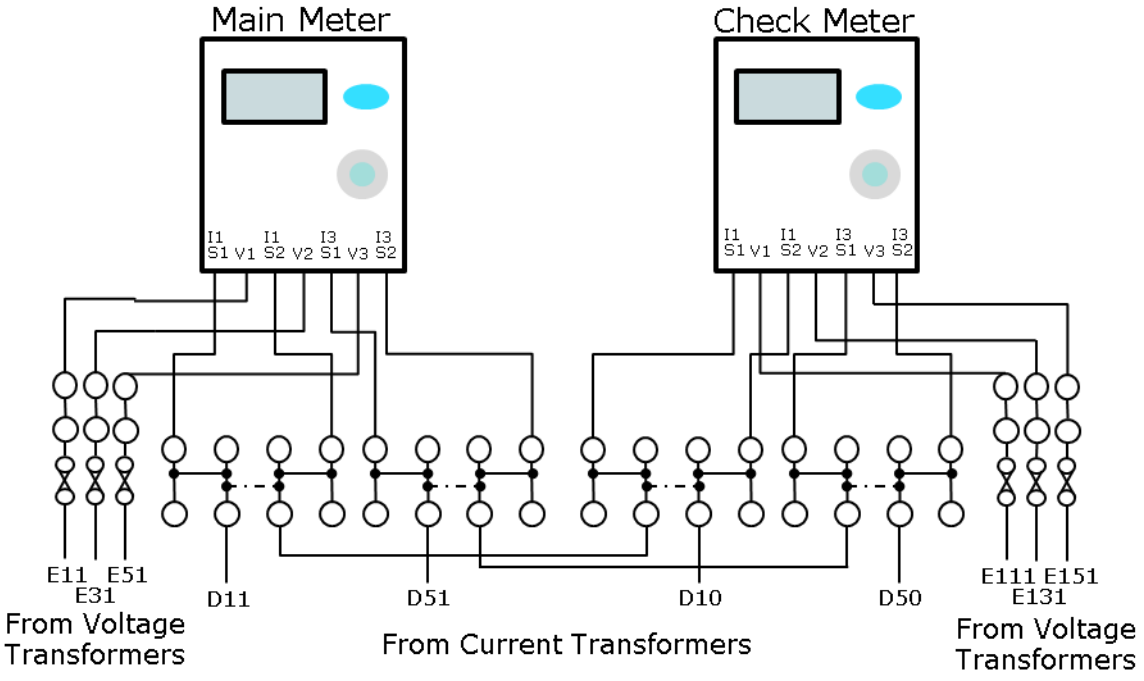


Figure 11: Test Facilities Example – CoP2 and Private Network Type 2 (separate CTs)

Figure 11 is an example of the minimum testing facilities required for a CoP2 and Type 2 Private Network installation. If a second set of CTs and/or VTs is used for the check Meter, refer to Figure 10.

One set of multi-core cables will come from the VT and be used for main and check Meter. The connections will be separated in the metering panel.

Any other burden connected to the VT must be connected to another winding and separately fused.

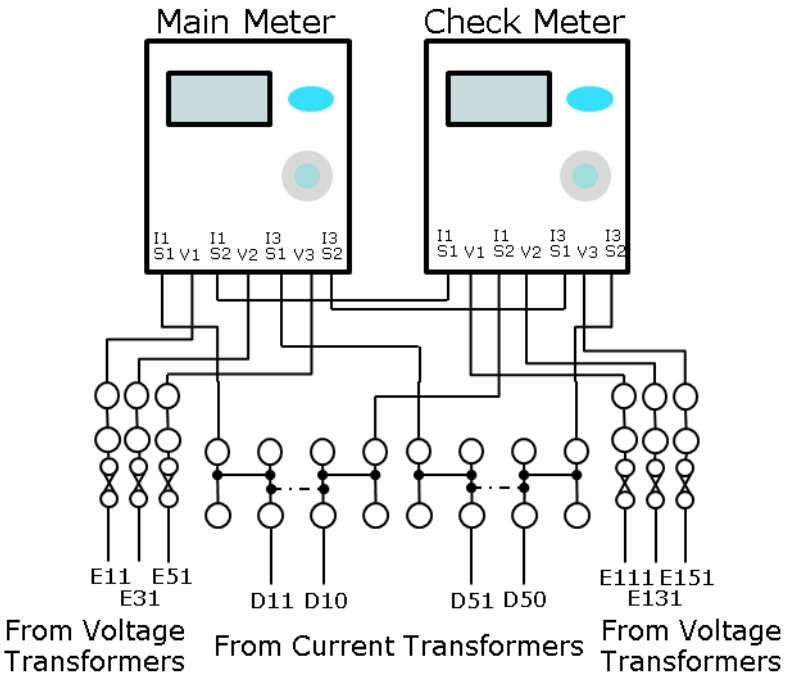


Figure 12: Test Facilities Example – CoP3 and Private Network Type 2 (one set of CTs) and Type 3

Figure 12 is an example of the minimum testing facilities required for a CoP3 and a Private Network Type 3 installation. It is only capable to be used in a Type 2 installation if one set of CTs is used. If a second set of CTs and/or a second VT is used for the check Meter refer to Figure 10.

One set of multi-core cables will come from the VT and be used for main and check Meter. The connections will be separated in the metering panel.

Any other burden connected to the VT must be separately fused.

An example of the type of test facility positions for normal running, isolation and testing can be seen in Figure 13. Other types of test facility can be used; the example used is for illustration of the functionality required.

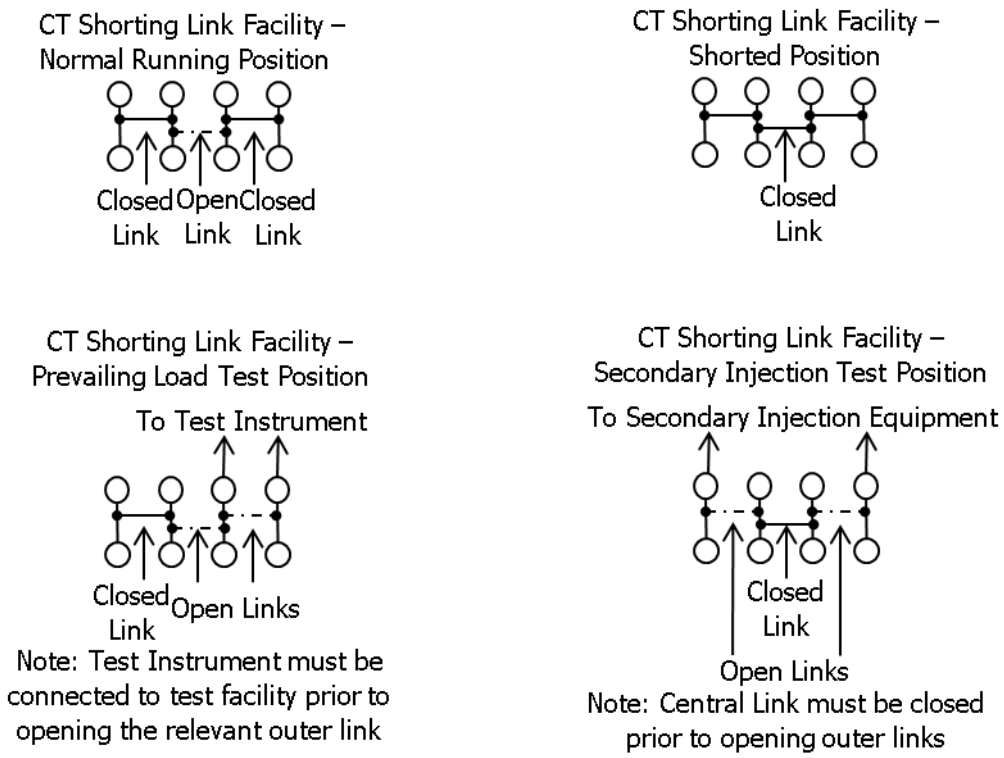


Figure 13: Test Facility – Running and Test Positions

Examples of the four modes of operation of the testing facilities connected to the CTs:

- Normal running position;
- Shorted position;
- Connection of a test instrument to prevailing load; and
- Shorted to allow secondary injection of the metering.

Other types of test facilities are available and may have a different method of operation to the example illustrated. The instructions on the operation of the test facilities as provided by their manufacturer must be followed. The example used above is for illustration of the functionality required.

11. What are the Meter setup requirements?

As a minimum the Half Hourly Meter must record Active Import (AI) and Active Export (AE) on a half hourly basis (i.e. an AI and AE load profile channel). If the Meter is also being used for BSC Settlement purposes there will be a requirement to record Reactive Energy in addition.

All data will be in a Settlement Period format. This will be of 30 minute duration starting on the hour or half hour; there will be 48 periods in a day starting at 00:00hrs. Each Settlement Period will be in energy format (e.g. multiples of Wh).

The Meter time will be set to Co-ordinated Universal Time (UTC), also known as Greenwich Mean Time (GMT). No switching between UTC and British Summer Time (BST) shall occur for Settlement Period data storage within the Meter.

The display of the Meter will have a cumulative AI and AE register (if used for BSC purposes there will be Reactive Energy registers in addition), the CT & VT ratios, current date and time as a minimum.

12. Need more information

For more information, please visit our website www.emrsettlement.co.uk or email us at contact@emrsettlement.co.uk or metering@emrsettlement.co.uk.

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