

PRIVATE NETWORK TECHNICAL SYSTEM REQUIREMENTS

CONTENTS

1.	Metering Points	9
2.	Measured Quantities and Demand Values for Metering Systems	10
3.	Metering Equipment Criteria	12
4.	Associated Facilities	21
5.	Access to Data	21
6.	Meter Checks	22
7.	Commissioning, Records and Proving	22

ACRONYMS

CfD: Contract for Difference

CT: Current Transformer

HHU: Hand-held unit

HV: High Voltage

ID: Identifier

IEC: International Electrotechnical Commission

IU: Interrogation Unit

kVA: Kilovoltamperes

kVArh: Kilovoltamperes reactive hour

kW: Kilowatt

kWh: Kilowatt hours

LIU: Local Integration Unit

LLF: Line Loss Factor

LV: Low Voltage

MVArh: Mega Volt Amperes Reactive hour

MWh: Megawatt hours

UTC: Co-ordinated Universal Time

VT: Voltage Transformer

DEFINITIONS

Terms not defined in these Private Network Technical System Requirements shall have the meanings given to them in the Private Network CfD Agreement (to the extent they are defined therein) or, to the extent that they are not defined either in this document or in the Private Network CfD Agreement, the meanings given to them in the Private Network Metering Operational Framework from time to time. To the extent that a term is defined in both the Private Network CfD Agreement and this document, then in relation to the technical standards set out herein only (and not in relation to the obligations of the Generator or the CfD Counterparty pursuant to the Private Network CfD Agreement), the definitions in this document shall apply instead of the definition in the Private Network CfD Agreement.

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 instantaneous active power, measured in units of watt-hours or standard multiples thereof.

BSC means the Balancing and Settlement Code.

CfD Counterparty means Low Carbon Contracts Company Limited, a company incorporated under the laws of England and Wales whose registered office is [●] and whose company number is 08818711.

CfD Settlement Activities means:

- (A) the calculation, invoicing, reconciliation and settlement of payments to be made pursuant to the Private Network CfD Agreement; and
- (B) the calculation of collateral requirements and the provision of collateral in accordance with the Conditions.

Check Meter means the Metering Equipment that the Generator is required to install and maintain under paragraph 3.2.2 of Section A of the Private Network Metering Operational Framework for each Main Meter installed by the Generator.

Conditions means the terms and conditions set out in version 1 of the document entitled "FiT Contract for Difference Standard Terms and Conditions" as at [date] (as amended, modified, supplemented or replaced by the Private Network CfD Agreement and as may be amended, modified, supplemented or replaced from time to time in accordance with the Conditions).

Consumption Data Comparison Check means the checking process described in paragraph 3.2.5 of Section B of the Private Network Metering Operational Framework and in paragraph 6.2 of these Private Network Technical System Requirements.

Correct Energy Measurement Check means the checking process described in paragraph 3.2.4 of Section B of the Private Network Metering Operational Framework and in paragraph 6.1 of these Private Network Technical System Requirements.

Customer Meter means the Meter of an Onsite Customer for the purposes of measuring the Customer Metered Volume.

Customer Metered Volume means, in relation to a Settlement Unit, the volume of Electricity determined as at a Customer Metering Point, which flowed in relation to that Settlement Unit, and where there are multiple Customer Metering Points, the Customer Metered Volume shall mean the aggregate of the input volumes of Electricity supplied by the Generator to the Onsite Customers as measured at those Customer Metering Points (but, for the avoidance of doubt, where the Generator is an Islanded Generator, the Customer Metered Volume shall be equal to zero (0)).

Customer Metering Point means, in relation to an Onsite Customer, a Meter located at that Onsite Customer for the purposes of measuring the Electricity supplied by the Generator to that Onsite Customer for the CfD Settlement Activities.

Demand means the amount of Electricity being consumed at any given time.

Demand Period means the time for which the Meter is recording Metered Volume.

Distribution System has the meaning given to that term in section 4(4) of the EA 1989.

EA 1989 means the Electricity Act 1989.

EA 2013 means the Energy Act 2013.

Electricity means Active Energy.

Facility means the facility identified as such in the Private Network CfD Agreement.

Facility Metering Equipment means the Metering Equipment measuring the flows of Electricity associated with the Facility, its Metering System, any Onsite Customer (including any Customer Meter) and, in the case of a Dual Scheme Facility, the Metering Equipment used to measure the Imported Input Electricity of the Generating Station.

FiT Contract for Difference means:

- (A) a contract for difference (as such term is defined in section 6(2) of the EA 2013); or
- (B) an investment contract (as such term is defined in Schedule 2 to the EA 2013).

GB Transmission System means the system consisting (wholly or mainly) of high voltage electric lines owned by Transmission Licensees within Great Britain that is used for the transmission of Electricity from one (1) generating station to a substation or to another generating station or between substations or to or from any interconnector.

Generating Station means an installation comprising the Facility and one (1) or more other Generating Units (other than an interconnector and even where those Generating Units are situated separately) which the CfD Counterparty considers (acting reasonably) as being managed as, or comprising, one (1) power station or one (1) power generating station.

Generating Unit means any apparatus which produces Electricity.

Generator means the person identified as such in the Private Network CfD Agreement.

Generator Metered Volume means, in relation to a Settlement Unit, the net aggregate volume of exports and imports of Electricity determined as at the Generator Metering Point, which flowed in that Settlement Unit.

Generator Metering Point means the point at which Generator Metered Volume is measured for the purposes of the CfD Settlement Activities and is net of any Generating Unit demand for Electricity.

Hybrid Generator means a Private Network Generator who supplies Electricity to an Onsite Customer and who has the ability to spill any excess Electricity to a licensed network.

Interrogation Unit means a hand held unit (“HHU”) or local interrogation unit (“LIU”), or a portable computer which can enter Metering Equipment parameters, extract information from the Metering Equipment and store such information for later retrieval.

Islanded Generator means a Private Network Generator who supplies Electricity solely to the Private Network on which it operates and who does not have a connection to the Total System.

Key Meter Technical Details means those Meter Technical Details set out in paragraph 7.3 of these Private Network Technical System Requirements.

Line Loss Factor means a multiplier used to scale the volume of Electricity generated to account for losses on the Distribution System and shall, in relation to a Private Network Generator, be applied in accordance with the provisions of the BSC.

Loss Adjusted Metered Output means:

- (A) in respect of any Facility which is not a Dual Scheme Facility, the Net Metered Volume for the Facility in respect of a Settlement Unit as measured by the Facility Metering Equipment, adjusted for:
- (i) the applicable Line Loss Factor; or
 - (ii) any new or substituted multiplier or factor which is in the nature of, or similar to, a Line Loss Factor; and
 - (iii) the applicable Transmission Loss Multiplier; or
 - (iv) any new or substituted multiplier which is in the nature of, or similar to, a Transmission Loss Multiplier, or
- (B) in respect of any Facility which is a Dual Scheme Facility, the Net Metered Volume for the Facility in respect of a Settlement Unit as measured by the Facility Metering Equipment less the Imported Electricity Allowance of the Facility in respect of such Settlement Unit (as determined in accordance with Condition 13 (*Baseload Dual Scheme Facilities*) or Condition 19 (*Intermittent Dual Scheme Facilities*) (as applicable)) of the Conditions, such net amount being adjusted for:

- (i) the applicable Line Loss Factor; or
- (ii) any new or substituted multiplier or factor which is in the nature of, or similar to, a Line Loss Factor; and
- (iii) the applicable Transmission Loss Multiplier; or
- (iv) any new or substituted multiplier which is in the nature of, or similar to, a Transmission Loss Multiplier.

Main Meter means the Metering Equipment that the Generator is required under paragraph 3.2.2 of Section A of the Private Network Metering Operational Framework to install to measure Electricity supplied by the Generator.

Material Change means a change to the Metering Equipment or Communications Equipment other than a change by way of repair, modification or replacement of any component which is not a substantial part of the Metering System even where an enhanced or equivalent component is used for the repair, modification or replacement rather than an identical component.

Measurement Quantity ID means the set of measured quantities of Active Energy (kWh) that is supported by the Metering System in the Private Network Technical System Requirements.

Measurement Transformers means either a current transformer (CT) or a voltage transformer (VT) or a device carrying out both such functions, whose purpose is to enable the Metering Equipment to operate at more convenient currents and/or voltages (as applicable) than are present on the power system being measured.

Meter means a device for measuring Active Energy and/or Reactive Energy.

Meter Commissioning Test means the Meter commissioning test described in paragraph 7.1 of these Private Network Technical System Requirements.

Meter Multiplier means a multiplier which converts the Meter Register cumulative reading into MWh/MVArh values.

Meter Register means the physical Meter reading displayed in kWh or kVArh.

Meter Serial Number means the serial number for the corresponding Main Meter.

Meter Technical Details means all technical details (including Outstation channel mapping) of a Metering System required to enable metered data to be collected and correctly interpreted from that Metering System as referred to in the Private Network Metering Operational Framework and these Private Network Technical System Requirements.

Metered Volume means the Customer Metered Volume and/or the Generator Metered Volume, as the context requires.

Metering Equipment means Meters, Measurement Transformers, metering protection equipment including alarms, circuitry, associated Communications Equipment and Outstations and wiring.

Metering System means particular commissioned Metering Equipment installed for the purposes of measuring the quantities of exports and imports at the Generator Metering Point.

Metering Points means the Generator Metering Point and the Customer Metering Point.

Net Metered Volume means Generator Metered Volume less Customer Metered Volume.

Onsite Customer means a customer of which the Generator is the supplier of Electricity pursuant to a Market Supply Agreement and which is located on the same Private Network as the Generator.

Outstation means equipment which receives and stores data from a Meter(s) for the purpose, inter alia, of the transfer of that data to the CfD Counterparty, and which may perform some processing function before such transfer and which may be one or more separate units or be integral with the Meter.

Outstation ID means a unique identifier of up to 20 alphanumeric characters used in the interrogation of the Outstation, the first four digits being the Meter Serial Number and the remainder being any combination of characters.

Outstation Number of Channels means the total number of channels configured in the Outstation.

Password means the password level stated in these Private Network Technical System Requirements for the Outstation.

Primary Energy means Active Energy being produced by the Generator.

Private Network CfD Agreement means the FiT Contract for Difference entered into between the Generator and the CfD Counterparty in relation to the Facility.

Private Network Generator means a Generator in relation to a Generating Station which:

- (A) is exempt from the requirement to hold a license for the generation of Electricity pursuant to the Electricity (Class Exemptions from the Requirement for a License) Order 2001; and
- (B) does not exclusively generate Electricity for or convey electricity on a licensed Distribution System or the Licensed Transmission System.

Private Network Metering Operational Framework means the document containing rules relating to Metering for Private Network Generators, as set out in Annex [●] of the Conditions.

Private Network Technical System Requirements means this document.

Proving Test means the test described in paragraph 3.1.5(c) of Section C of the Private Network Metering Operational Framework.

Pulse Multiplier means the constant which has to be applied to the collected period data from each Outstation channel to convert the values to MWh/MVArh.

Rated Measuring Current means the capacity of the Meter to measure currents.

Reactive Energy means the electrical energy produced, flowing or supplied by an electric circuit in quadrature to Active Energy at a time interval, being the integral with respect to time of instantaneous reactive power, measured in units of volt ampere reactive hours or standard multiples thereof.

Reasonable and Prudent Standard means the standard of a person seeking in good faith to comply with its contractual obligations and, in so doing and in the general conduct of its undertaking, exercising that degree of skill, diligence, prudence and foresight that would reasonably and ordinarily be expected from a skilled and experienced person complying with all applicable regulatory requirements and engaged in the same type of undertaking under the same or similar circumstances and conditions.

Settlement Instation means a computer based system which collects or receives data on a routine basis from selected Outstations.

Settlement Unit has the meaning given to that term in the Private Network CfD Agreement.

Total System means the Transmission System and each Distribution System.

Transmission Licence means an electricity transmission licence granted or treated as granted pursuant to section 6(1)(b) of the EA 1989 that authorises a person to transmit Electricity.

Transmission Licensee means any person who is authorised by a Transmission Licence to transmit electricity.

Transmission Loss Multiplier means a multiplier used to scale the volume of Electricity generated to account for losses on the Transmission System and shall, in relation to a Private Network Generator, be applied in accordance with the provisions of the BSC.

Transmission System means those parts of the GB Transmission System that are owned by a Transmission Licensee within the transmission area specified in its Transmission Licence.

PRIVATE NETWORK TECHNICAL SYSTEM REQUIREMENTS

GENERAL APPLICATION

The Generator shall comply at all times with the requirements of these Private Network Technical System Requirements. The Private Network Technical System Requirements applicable to a Generator's Private Network CfD Agreement shall be the version current at the date of the Generator's Private Network CfD Agreement, save that in the event of a Material Change, the applicable Private Network Technical System Requirements shall be the version current at the date of that Material Change.

Amendments to these Private Network Technical System requirements shall be subject to the Change Control Procedure in Annex 2 (*Change Control Procedure*) to the Conditions.

1. METERING POINTS

Metered Output and Loss Adjusted Metered Output shall be calculated on the following basis:

$$\text{Loss Adjusted Metered Output (LAMO)} = (\text{GMV} - \text{CMV}) \times \text{LLF} \times \text{TLM}$$

$$\text{Metered Output} = (\text{LAMO} + \text{CMV}) \times \text{RQM} \times \text{CHPQM}$$

Where:

GMV	=	Generator Metered Volume
CMV	=	Customer Metered Volume
LLF	=	Line Loss Factor
TLM	=	Transmission Loss Multiplier
RQM	=	Renewables Qualifying Multiplier
CHPQM	=	Combined Heat and Power Qualifying Multiplier
CMV	=	Zero (0) if the Generator is an Islanded Generator

If the Generator is a Hybrid Generator, the Generator shall ensure that a Customer Meter is installed that the location of the Customer Metering Point is appropriate to measure the Customer Metered Volume and calculate the Net Metered Volume. Where the Generator has more than one Onsite Customer, it shall ensure that a separate Customer Meter is installed for each Onsite Customer.

The Metered Volume used for the CfD Settlement Activities shall be adjusted for line losses and transmission losses to give a Loss Adjusted Metered Output figure.

This figure will be added to the Customer Metered Volume measured at the Customer Metering Point.

The Customer Metered Volume shall not be adjusted for losses.

A Hybrid Generator will receive payment in accordance with the terms of the Private Network CfD Agreement for the Loss Adjusted Metered Output and the Customer Metered Volume, as adjusted in accordance with any applicable multipliers.

2. MEASURED QUANTITIES AND DEMAND VALUES FOR METERING SYSTEMS

The Generator must ensure that it reports its gross input and gross output for the purposes of the CfD Settlement Activities.

2.1 Measured quantities

For each separate circuit the following energy measurements are required for the purposes of the CfD Settlement Activities:

- (i) Import kWh; and
- (ii) Export kWh.

2.2 Accuracy requirements

2.2.1 Overall accuracy

The overall accuracy of the energy measurements at or referred to a Metering Point shall at all times be within the limits of error as shown:

Metering Type 1 (Metering of circuits rated greater than 100MVA for the purposes of the CfD Settlement Activities)

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% 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%

Metering Type 2 (Metering of circuits not exceeding 100MVA for the purposes of the CfD Settlement Activities)

CONDITION	Limits of error at stated system power factor

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% 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%

Metering Type 3 (Metering of circuits not exceeding 10MVA for the purposes of the CfD Settlement Activities)

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% inclusive	1	± 1.5%
Below 10% to 5%	1	± 2.0%
120% to 10% inclusive	0.5 lag and 0.8 lead	± 2.5%

The following checks may be performed to verify the overall accuracy requirements of the Metering System:

- (a) that the Measurement Transformers relate to the test certificates provided;
- (b) that the test certificate calibration details in relation to the Metering Equipment are in accordance with applicable requirements in the Private Network Technical System Requirements;
- (c) that the Metering Equipment installed is in accordance with the Private Network Technical System Requirements and, where required, the Main Meters and Check Meters are correctly identified.

2.2.2 Compensation for power transformer and line losses

Where the gross input and gross output cannot be measured at the Generator Metering Point, the Generator should notify the CfD Counterparty of where they are being measured.

The accuracy compensation may be achieved in the Metering Equipment and in this case, provided or applied values shall be recorded. Supporting evidence to justify the accuracy

compensation criteria shall be submitted to and available for inspection by either the CfD Counterparty or its appointed agent.

Alternatively, the accuracy compensation may be provided or applied in the software of the relevant data collection system used for the purposes of the CfD Settlement Activities. In this case, the factors shall be passed to the appropriate agency and evidence to justify the accuracy compensation criteria shall be submitted to and made available for inspection by either the CfD Counterparty or its appointed agent.

3. METERING EQUIPMENT CRITERIA

Although these Private Network Technical System Requirements identify separate items of equipment, nothing in them prevents such items being combined to perform the same task provided the requirements of these Private Network Technical System Requirements, the Private Network Metering Operational Framework and the Generator's Private Network CfD Agreement are met.

Metering Equipment other than outdoor Measurement Transformers shall be accommodated in a clean and dry environment.

For each circuit, other than one which is permanently disconnected, the voltage supply to any Meters, displays and Outstations shall be connected such that it is normally energised to facilitate reading of the Meter Register(s) and local and remote interrogation of the Outstation.

3.1 Measurement Transformers

The terms "current transformer" and "voltage transformer" used below in paragraphs 3.1.1 and 3.1.2 do not preclude the use of other measuring techniques with a performance equal to that specified for such Measurement Transformers.

For each circuit, current transformers (CT) and voltage transformers (VT) shall meet the requirements set out in paragraphs 3.1.1 and 3.1.2.

Additionally, where a combined unit measurement transformer (i.e., VT and CT) is provided the 'Tests for Accuracy' as covered in clause 8 of IEC Standard 44-3 covering mutual influence effects shall be met.

All Measurement Transformers shall be of a wound construction.

3.1.1 Current transformers

All current transformers for Type 1, 2 and 3 metering should meet the following criteria:

Type of Meter	Relevant Standard	Minimum Class Accuracy	No. of sets	Usage
1	IEC 60044-1	0.2s	2	1 Set of CTs dedicated to the Main Meter only

Type of Meter	Relevant Standard	Minimum Class Accuracy	No. of sets	Usage
				and 1 set supplying the Check Meters. Check Meter CTs can be used for other purposes providing the accuracy requirements in 2.2.1 are met
2	IEC 60044-1	0.2s	1	CTs shall be dedicated to CfD Settlement Activities supplying both Main Meters and Check Meters. An additional set of CTs may be fitted for the Check Meter which may also be used for other purposes providing the accuracy requirements in 2.2.1 are met.
3	IEC 185	0.5	1	1 set of CTs for Main Meters and Check Meters CfD Settlement Activities purposes, but other uses if the accuracy requirements in 2.2.1 are met.

3.1.2 Voltage transformers

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

The secondary windings of voltage transformers for Type 1, 2 and 3 metering used for the purposes of the CfD Settlement Activities shall meet the following criteria:

Type of Meter	Relevant Standard	Minimum Class Accuracy	No. of VTs required	Usage
1	IEC 60044-2	0.2	2 VTs (or 1 VT with two (2) or more secondary windings)	1 VT secondary winding dedicated to the Main Meter for CfD Settlement Activities purposes only. Check Meter VT's can be used for other purposes.
2	IEC 60044-2	0.5	1	VT supplying Main Meters and Check Meters only for CfD Settlement Activities. VT secondary winding shall be dedicated to CfD Settlement Activities supplying both Main Meters and Check Meters. An additional VT or secondary winding may be used for the Check Meter which may also be used for other purposes providing the accuracy requirements in 2.2.1 are met.

Type of Meter	Relevant Standard	Minimum Class Accuracy	No. of VTs required	Usage
3	IEC 186	1	1	CfD Settlement Activities purposes, but other uses if accuracy requirements in 2.2.1 are met

3.1.3 Measurement Transformer specification (where appropriate)

Where practicable, the following may be subject to checks:

- (a) ratio, class, rated burden and polarity from the labels physically attached to the Measurement Transformers and/or the identification plates attached to switchgear or other enclosures containing Measurement Transformers (although this may not always be practical for safety reasons); and
- (b) Test records/certificates detailing specific measured errors held by the equipment owner, associated with the Measurement Transformers on site or from agreed generic CT/VT certificates in the case of CTs and VTs.

3.2 Fusing and testing facilities

Testing facilities shall be provided close by the Meters of each circuit, which enables such Meters to be routinely tested and/or changed safely with the circuit energised (see Appendix A).

Separate fusing shall be provided locally for:

- (a) the Main Meter;
- (b) the Check Meter; and
- (c) any other Metering Equipment burden;

Local fusing shall discriminate with the source fusing.

A typical arrangement is illustrated in Appendix A of these Private Network Technical System Requirements.

Where current transformers are used on low voltage installations, the voltage supply to the Metering Equipment shall be fused as close as practicable to the point of that supply with a set of isolating links, suitably identified, provided locally to the Metering Equipment. If that point of supply is close to the Metering Equipment, then the isolating links may be omitted.

3.3 Meters

All Meters shall be static.

For each circuit Main Meters and Check Meters shall be supplied and may be used for a period not exceeding ten (10) years from the date of manufacture.

All Meters should include Outstation functionality.

Meters provided for in these Private Network Technical System Requirements shall be in accordance with Schedule 7 of the EA 1989.

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 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:

- (a) for Meters separate from the display and/or Outstation the ratios shall be recorded on the nameplate of the Meter; and
- (b) for Meters combined with the display and/or the Outstation, the ratios shall be displayed and downloaded during the interrogation process. In addition, the compensation factor that has been applied for measurement transformer errors and/or system losses, where this is a constant factor applied at security level 3 shall be similarly displayed and downloaded.

All Meters shall include a non-volatile Meter Register of cumulative energy for each measured quantity (see paragraph 2.2.1). The Meter Register(s) shall not roll-over more than once within a six (6) month period.

3.4 Displays and facilities for Generator or supplier information

3.4.1 Mandatory displays

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

- (a) measured quantities as per paragraph 2.2.1;
- (b) current time ("**UTC**") and date;
- (c) the CT and/or VT ratios that the Meter has been programmed to, where appropriate; and
- (d) the compensation factor that has been applied for Measurement Transformer errors and/or system losses, where this is a constant factor applied at security level 3 (i.e. where the Meter is combined with the display and/or Outstation).

3.5 Outstation

An Outstations system shall be incorporated into Meters which receives and transfers data from the Settlement Instation.

The Outstation data shall be to a format in accordance with the CfD Settlement Activities and approved by the CfD Counterparty.

The Outstation shall facilitate the metering data to be read by Instations other than the Settlement Instation provided the requirements of paragraph 3.5 of these Private Network Technical System Requirements are satisfied.

For the purpose of transferring stored metering data from the Outstation to the Settlement Instation, a unique Outstation ID shall be provided.

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 a separate modem associated with the Outstation system is used, then it shall be provided with a separately fused supply either from a secure supply or from a measurement VT (see clause 3). Alternatively, line or battery powered modem types may be used.

3.5.1 Data storage

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

- (a) each Demand value shall be identifiable to its respective date and time;
- (b) a storage capacity of 48 periods per day for a minimum of 100 days for all demand values as defined in paragraph 2.2.1. The stored values shall be integer multiples of kW;
- (c) the resolution of the energy transferred into the demand registers shall be within $\pm 0.1\%$ (at full load) of the amount of Active Energy measured by the associated Meter;
- (d) 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;
- (e) where a separate Outstation is used, cumulative register values shall be provided in the Outstation which shall be set to match and increment with the Meter Registers;
- (f) 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 paragraph 3.5.2;
- (g) 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;

- (h) to cater for continuous supply failures, the clock, calendar and all data shall be supported for a period of 20 days without an external supply connected;
- (i) any "read" operation shall not delete or alter any stored metered data; and
- (j) an Outstation shall provide all of the metered data stored from the commencement of any specified date upon request by the Settlement Instation.

3.5.2 Time keeping

- (a) The Outstation time shall be set to Co-ordinated Universal Time Clock (UTC). No switching between UTC and British Summer Time (BST) shall occur for CfD Settlement Activities data storage requirements.
- (b) Time synchronisation of the Outstation may be performed remotely by the Generator (or its data collection agent) as part of the normal interrogation process or locally by an Interrogation Unit.
- (c) When time synchronisation occurs, the relevant period(s) shall be marked with an alarm indication, as outlined in paragraph 3.5.3.
- (d) The overall limits of error for the time keeping allowing for a failure to communicate with the Outstation for a period of 20 days shall be:
 - (i) the completion of each Demand Period shall be at a time which is within ± 20 seconds of UTC; and
 - (ii) the duration of each Demand Period shall be within $\pm 0.1\%$, except where time synchronisation has occurred in a Demand Period.

3.5.3 Monitoring facilities

Monitoring facilities shall be provided for each of the following conditions and shall be reported, as separate alarm indications, tagged to the relevant Demand Period(s), via online communications and the LIU:

- (a) phase failure of any one or a combination of phases;
- (b) Metering Equipment resets caused by other than a supply failure (where fitted);
- (c) battery monitoring (where battery fitted);
- (d) interrogation port access which changes time and/or date;
- (e) where different from (iv), Demand Period(s) which have been truncated or extended by a time synchronisation;
- (f) interrogation port access which changes data other than time and/or date; and

- (g) reverse running (if fitted).

In addition to (b), detected errors in Metering Equipment functionality should be recorded as an event alarm with date and time.

Any alarm indications shall not be cancelled or deleted by the interrogation process and shall be retained with the data until overwritten. The alarm shall reset automatically when the abnormal condition has been cleared.

3.6 Communications

Outstations shall provide 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 and in Appendix B and shall be incorporated for both local and remote access. Separate security levels shall be provided for the following activities:

- (i) Level 1 – Password for:

Read only of the following metering data, which shall be transferable on request during the interrogation process:

Outstation ID;

- (a) demand values as defined in paragraph 2.1.2 for Main Meters and Check Meters;
- (b) cumulative measured quantities as defined in paragraph 2.1.1 for Main Meters and Check Meters;
- (c) maximum demand (MD) for kW or kVA per programmable charging period i.e. monthly, statistical review period;
- (d) multi-rate cumulative Active Energy as specified by the Generator;
- (e) the Measurement Transformer ratios, where appropriate (see paragraph 5.3);
- (f) the 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;
- (g) alarm indications; and
- (h) Outstation time and date.

- (ii) Level 2 – Password for:

- (a) corrections to the time and/or date; and

- (b) resetting of the MD.
- (iii) Level 3 – Password for:
- Programming of:
- (a) the displays and facilities as defined in paragraph 3.4;
 - (b) the Measurement Transformer ratios, as appropriate (see paragraph 3.3);
 - (c) the 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
 - (d) the 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.

- (iv) Level 4 – Password or removal of Metering Equipment cover(s) necessitating the breaking of a seal for:
- (a) calibration of the Metering Equipment;
 - (b) setting the Measurement Transformer ratios, as appropriate;
 - (c) programming the Measurement Transformer error correction factor and/or system loss factor where this is other than a single factor; and
 - (d) 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). For example, 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 Private Network Metering Operational Framework.

3.6.1 Local interrogation

An interrogation port shall be provided for each Outstation.

3.6.2 Remote interrogation

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

It shall not be possible to disconnect the remote communications connection to/from the Outstation without the breaking of an appropriate seal (see paragraph 3.7).

Interrogation of an Outstation shall be possible using a method to be agreed with the Generator

The data shall be to a format compatible with a Generator's CfD requirements approved by the CfD Counterparty.

3.7 Appropriate seals

3.7.1 The Generator shall ensure that the Metering Equipment is appropriately sealed so as to provide assurance that the following parameters are met:

- (a) all standards applicable to the Generator under Electricity Safety, Quality and Continuity Regulations 2002; and
- (b) a Reasonable and Prudent Standard of anti-tamper protection.

4. ASSOCIATED FACILITIES

4.1 Interrogation Unit

The operator may interrogate the Metering Equipment using an Interrogation Unit ("IU").

The IU may be used for programming, commissioning, maintenance/fault finding and when necessary the retrieval of stored metering data. The data retrieved by the IU shall be compatible with the Settlement Instation.

The IU shall have a built-in security system, such as a password, so that the IU becomes inoperative and non-interrogatable if it is lost, stolen, etc. Such password can be applied at power-on of the device and/or on entry to the IU software application.

4.2 Additional features

Additional features may be incorporated within or associated with the Metering Equipment provided but these shall not interfere with or endanger the operation of the CfD Settlement Activities.

5. ACCESS TO DATA

Access to metering data shall be in accordance with the provisions of the Private Network Metering Operational Framework. Such access must not interfere with or endanger the security of the data or the collection process for the purposes of the CfD Settlement Activities.

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

6. METER CHECKS

6.1 Correct Energy Measurement Test

For the purposes of the Correct Energy Measurement Test, Primary Energy may be established using the following methods:

- (a) by comparing the demand derived from independently measured primary values to the Meter's instantaneous demand reading for the same period;
- (b) by comparing the demand derived from independently measured secondary values where the primary/secondary ratios can be established to the Meter's demand reading for the same period;
- (c) by using an alternative measurement device for comparison with the Meter; or
- (d) by using appropriate commissioning records which the Generator shall provide the CfD Counterparty, or its appointed agent.

6.2 Consumption Data Comparison Check

The Consumption Data Comparison Check shall take the following format:

- (a) the Meter Technical Details and the load (or generation) provided by the Generator a half-hour period shall be compared to that observed on-site. Consideration shall also be given to commissioning and historic Proving Test information;
- (b) a reading (for the dominant Active Energy flow direction at the time) of the cumulative register on the Meter's display at the beginning and end of the half-hour period that is to be downloaded from the Meter's Outstation shall be taken; and
- (c) the true Meter Register half-hour advance for the half-hour period shall be calculated using the Meter Register multiplier.

7. COMMISSIONING, RECORDS AND PROVING

7.1 Meter Commissioning Tests

Meter Commissioning Tests shall be performed on site to confirm and record, so far as appropriate, that:

- (a) the current transformers are of the correct ratio and polarity and correctly located to record the required power flow;
- (b) the voltage transformers are the correct ratio and polarity and correctly located to record the required power flow;
- (c) the relationships between voltages and currents are correct and that phase rotation is standard at the Meter terminals;

- (d) the burdens on the Measurement Transformers are within the correct limits;
- (e) the Meters are set to the same current transformer and voltage transformer ratios as the installed Measurement Transformers;
- (f) the Meters have the correct compensation for errors in the Measurement Transformers/connections and losses in power transformers where appropriate;
- (g) the output of the Metering System correctly records the energy in the primary system at the Generator Metering Point and the Customer Metering Point; and
- (h) Metering Equipment detects phase failure and operates the required alarms.

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

7.2 Records

Records required to be provided to the CfD Counterparty under the Private Network Metering Operational Framework shall include, as a minimum and where applicable, the following information:

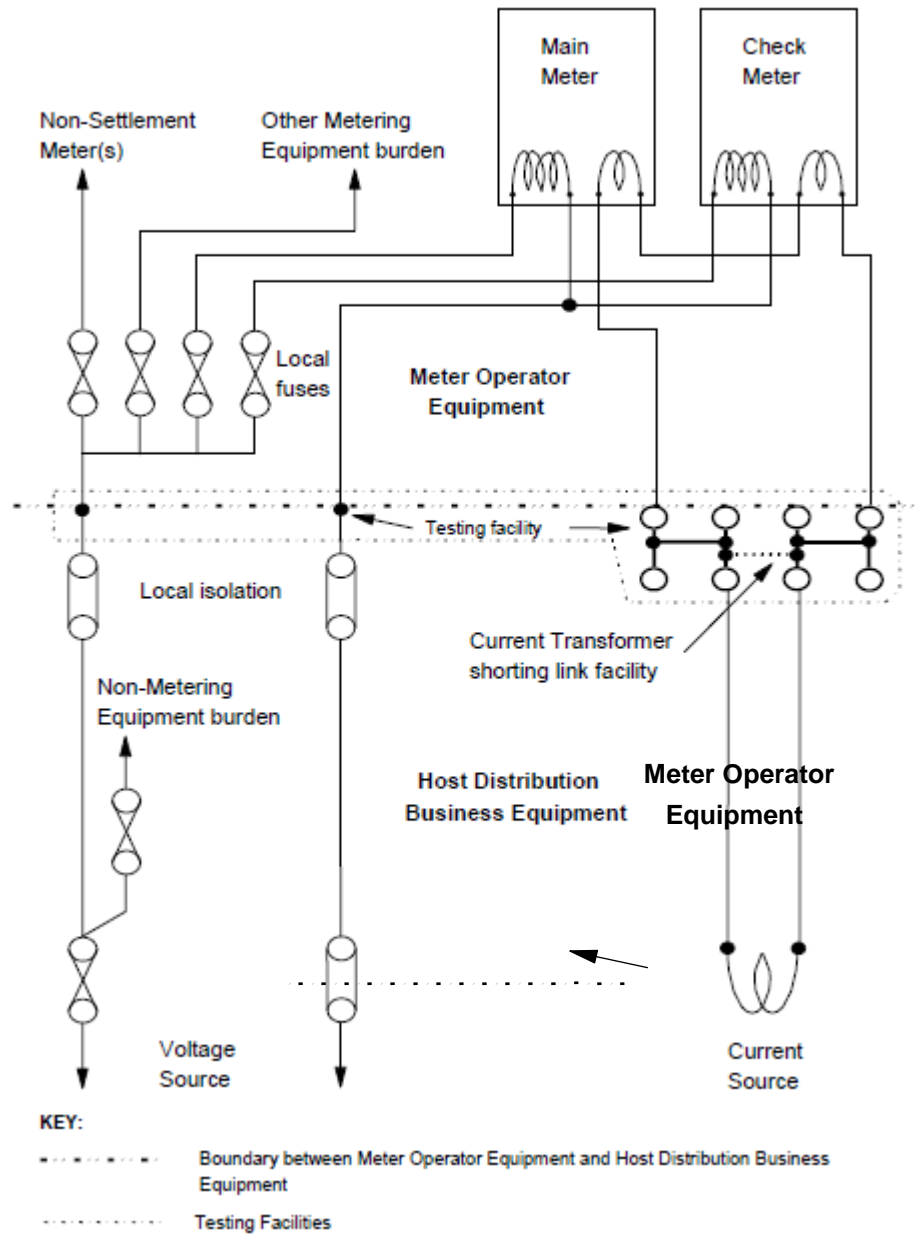
- (a) site name;
- (b) site address;
- (c) Meter Serial Number;
- (d) name of commissioning body (even if the Generator does it);
- (e) date of commissioning;
- (f) name of person responsible for undertaking commissioning (and organisation);
- (g) reason for commissioning;
- (h) Meter details (including any certificate identity);
- (i) current transformers details (including any certificate identity);
- (j) voltage transformers details (including any certificate identity);
- (k) circuit name (where more than one); and
- (l) results of inspections, tests and observations.

7.3 Proving

The following are Key Meter Technical Details that, if changed, require performance of a Proving Test:

- (a) Outstation ID;
- (b) Meter Serial Number;
- (c) Outstation Number of Channels;
- (d) Measurement Quantity ID;
- (e) Meter Multiplier;
- (f) Pulse Multiplier;
- (g) CT and/or VT Ratios; and
- (h) access to Metering Equipment at Level 3 – Password.

Appendix A: Typical testing facilities and fusing arrangements



Appendix B: Passwords

The Passwords specified in paragraph 3.6 of these Private Network Technical System Requirements 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 logging 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.